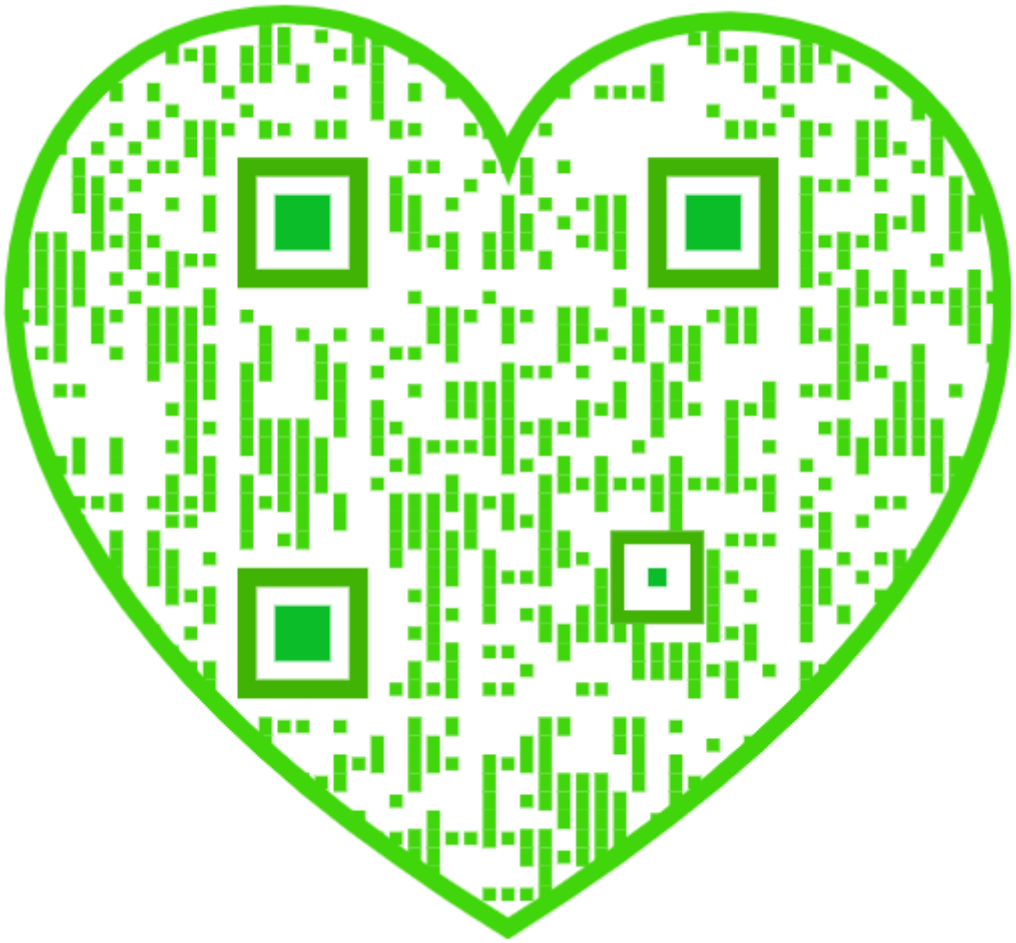

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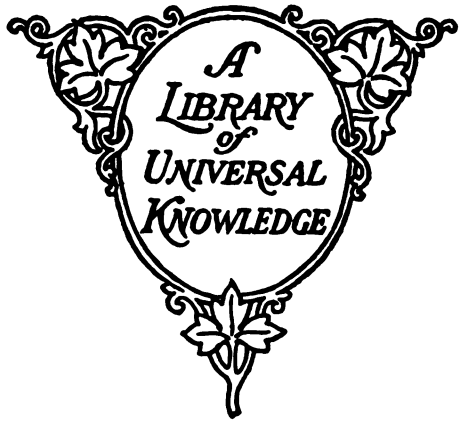

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KEY TO PRONUNCIATION.

ā	far, father
ā	fate, hate
a or ă	at, fat
ā	air, care
ạ	ado, sofa
â	all, fall
ch	choose, church
ē	eel, we
e or ĕ	bed, end
ė	her, over: also Fr. *e*, as in *de; eu*, as in *neuf;* and *oeu*, as in *boeuf, coeur;* Ger. *ö* (or *oe*), as in *ökonomie.*
ẹ	befall, elope
ē	agent, trident
ff	off, trough
g	gas, get
gw	anguish, guava
h	hat, hot
h or H	Ger. *ch*, as in *nicht, wacht*
hw	what
ī	file, ice
i or ĭ	him, it
ị	between e and i, mostly in Oriental final syllables, as, Ferid-ud-din
j	gem, genius
kw	quaint, quite
ṅ	Fr. nasal *m* or *n*, as in *embonpoint, Jean, temps*
ñ	Span. *ñ*, as in *cañon* (căn′yŏn), *piñon* (pēn′yŏn)
ng	mingle, singing
nk	bank, ink
ō	no, open
o or ŏ	not, on
ô	corn, nor
ȯ	atom, symbol
ọ	book, look
oi	oil, soil; also Ger. *eu*, as in *beutel*
ö or oo	fool, rule
ou or ow	allow, bowsprit
s	satisfy, sauce
sh	show, sure
th	thick, thin
ṯh	father, thither
ū	mute, use
u or ŭ	but, us
ụ	pull, put
ü	between u and e, as in Fr. *sur*, Ger. *Müller*
v	of, very
y	(consonantal) yes, young
z	pleasant, rose
zh	azure, pleasure
′(prime), ″(secondary)	accents, to indicate syllabic stress

M the thirteenth letter of the English and most of the other West European languages, is one of the four liquids, or semi-vowels; it is also classed as a labio-nasal, its sound being produced when with lips closed and the whole uvula lowered the breath makes a humming noise as it issues through the nostrils. The lips play the same part in the pronunciation of m as in that of b, but in pronouncing b the nasal passage has no part. Hence when that passage is obstructed or closed the sound produced is that of b not of m.

The M as a capital letter has the same form in the Greek and the Latin alphabets and in all the alphabets derived from them, and in all those alphabets generally the same sound value.

In English there are a few words of Greek origin, mostly technical, in which mn begins a syllable or a word: in such cases the m is silent, for example, mnemonic, nemonic.

In many words derived from other languages the m of the original word is changed to n in English, examples: Comitatus (Lat.) county, or contrariwise n is changed to m; Anglo-Saxon henep becomes hemp. Often p is added after m to give that letter greater distinctness, for example, exemtus, exemptus, unkemmed, unkempt.

M. QUAD. See LEWIS, CHARLES BERTRAND.

MAARTENS, Maarten, mär'tĕn märtĕnz, pseudonym of the Dutch author, JOOST MARIUS WILLEM VAN DER POORTEN SCHWARTZ: b. Amsterdam, 15 Aug. 1858; d. Zeist, Holland, 4 Aug. 1915. He passed his early life in England; was educated in Germany and at the University of Utrecht, was admitted a barrister but chose literature as a profession, and in 1890 published his first work, 'The Sin of Joost Avelingh,' which at once arrested the attention alike of critics and of the reading public. This, like all his volumes, was written at first hand in English, not, as has been sometimes supposed, translated from Dutch MS. Maartens thus presented the curious instance of an author electing to address wholly a foreign public. Indeed it was only with reluctance, to safeguard himself against unsatisfactory translations, that he consented to the publication of his books in Dutch. His further works are 'An Old Maid's Love' (1891); 'A Question of Taste' (1891); 'God's Fool' (1892); 'The Greater Glory' (1894); 'My Lady Nobody' (1895); 'My Poor Relations' (1903); 'Dorothea' (1904); 'The Healers'; 'The Woman's Victory' (1906); 'The New Religion' (1907); 'Brothers All' (1909); 'The Price of Lis Doris' (1909); 'Harmen Pols, Peasant' (1910); 'Eve' (1912). In America 'The Greater Glory' first appeared serially in 'The Outlook.' 'God's Fool' is perhaps Maartens' best, but 'The Sin of Joost Avelingh' and 'The Greater Glory' have had the greatest popular success. These books afford a by no means flattering picture of the Dutch *bourgeoisie,* but are admittedly accurate.

MAASIN, mä-ä'sĭn, Philippines, (1) a pueblo of the province of Leyte, island of Visayas, situated on the extreme southwestern coast, 75 miles southwest of Tacloban. It is a handsome, well-built city, and has a large trade, mostly in hemp. Pop. 18,500; (2) a town of the province of Iloilo, Panay, on a tributary of the Sague branch of the Jalaur River, 18 miles northwest of Iloilo. Pop. 9,700.

MAASTRICHT. See MAESTRICHT.

MAAT, or MA'T, in ancient Egypt, the goddess of truth and justice. She is said to have guided the souls of the dead to Osiris (q.v.).

MAB, the fairy queen of Connaught and a familiar name in Celtic folklore. Mab has been celebrated by Shakespeare and other English poets. The name is of uncertain origin, being variously derived from the Midgard of the Eddas, the Habundia or Dame Abonde of Norman fairy lore, and from the Cymric *mab,* a child. According to Voss, Mab was not the fairy queen, the same as Titania, this dignity having been ascribed to her only by mistaking the use of the old English word *queen,* which originally meant only a woman. Queen Mab is mentioned in Shakespeare's 'Romeo and Juliet,' Ben Jonson's 'Satyr,' Randolph's pastoral of 'Amyntas,' Drayton's 'Nymphidia' and Milton's 'L'Allegro.'

MABÁLACAT, mä-bä-lä'kät, a pueblo of the province of Pampanga, Luzon, 16 miles north of Bacolor, the provincial capital. It is on the main road, and on the Manila and Dagupan Railroad. Pop. 10,600.

MABERY, mā'bĕr-ĭ, **Charles Frederic,** American chemist: b. North Gorham, Me., 13 Jan. 1850. He was graduated at the Lawrence Scientific School, Harvard, in 1876, and was assistant instructor in chemistry there from 1875 to 1883, when he became professor of chemistry in the Case School of Applied Science of Cleveland, Ohio, and emeritus professor since that date to 1901. In the investigation of the composition of American petroleum his work has brought him into special prominence. He

has also done valuable work in connection with electric smelting. The results of his original investigations since 1876 were published in the Proceedings of the American Academy of Arts and Sciences and in various chemical journals at home and abroad.

MABIE, Hamilton Wright, American editor, critic and essayist: b. Cold Spring, N. Y., 13 Dec. 1846; d. Summit, N. J., 31 Dec. 1916. He was graduated at Williams College in 1867 and from the Columbia University Law School in 1869. He joined the staff of the *Christian Union* (now the *Outlook*) in 1879 and later became associate editor. He was a member of the American Academy of Arts and Letters and received honorary degrees from Williams, Union, Western Reserve and Washington and Lee universities. In his lectures and papers he constantly advocated the reading of good books, and his own works on literature, etc., have done much to cultivate a good taste in the American reading public. Among others he published 'Norse Stories Retold from the Eddas' (1882); 'Nature in New England' (1890); 'My Study Fire,' first series (1890); 'Short Studies in Literature' (1891); 'Under the Trees and Elsewhere' (1891); 'Essays in Literary Interpretation' (1892); 'My Study Fire,' 2d series (1894); 'Nature and Culture' (1897); 'Books and Culture' (1897); 'Work and Culture' (1898); 'The Life of the Spirit' (1889); 'William Shakespeare — Poet, Dramatist and Man' (1900); 'Works and Days' (1902); 'Parables of Life' (1902); 'Backgrounds of Literature' (1903); 'Myths Every Child Should Know' (1905); 'Fairy Tales Every Child Should Know' (1905); 'The Great Word' (1905); 'Heroes Every Child Should Know' (1906); 'Legends Every Child Should Know' (1906); 'Christmas To-day' (1908); 'Introductions to Notable Poems' (1909); 'American Ideals, Character and Life' (1913); 'Japan, To-day and To-morrow' (1914).

MABILLEAU, Léopold, French economist: b. Beaulieu (Indre et Loire), 1856. After teaching in a number of institutions he became in 1906 professor at the National Conservatory of Arts. He held many positions for the improvement of social conditions and lectured in the United States on social and economic questions. Mabilleau was made an officer of the Legion of Honor and a number of his works have been crowned by the Academy of Moral and Political Sciences. He has edited the works of several authors, has contributed to French magazines and has published 'Victor Hugo' (Paris 1893; 5th ed., 1911); 'Histoire de la philosophie atomistique' (1895); 'La prévoyance sociale en Italie' (1898); 'La co-operation en France' (1900); 'La mutualité française, doctrine et applications' (1904); 'Notions élémentaires d'instruction civique de droit usuel et d'économie politique' (1912). The latter was in collaboration with E. Levasseur and E. Delacourtie.

MABILLON, Jean, zhŏn mă-bē-yôn, French ecclesiastic and author: b. Saint Pierre du Mont, Champagne, 23 Nov. 1632; d. Paris, 27 Dec. 1707. Having joined the Benedictines of Saint Maur, he was chosen to assist Dom Jean d'Achery in the compilation of his 'Spicilegium Veterum Scriptorum,' and subsequently edited the works of Saint Bernard (1690) in the series of the fathers published by his congregation. In 1683 he was sent to Germany by Louis XIV to collect documents relating to French history; and the applause with which his 'Iter Germanicum,' a narrative of the journey, was received, induced the king to send him to Italy in 1685 to make purchases for the royal library. A result of this tour was his 'Musæum Italicum' (1687–89), a work of great value. Later he was selected by his superiors to refute Rancé, abbot of La Trappe, who had condemned the custom of permitting monks to study. His 'Essay on Monastic Studies,' which appeared in consequence in 1691, was equally remarkable for sound argument and good temper. His most important other works are 'Vetera Analecta' (1675–85); 'De Re Diplomatica' (1681); and 'De Liturgia Gallicana' (1685). He edited and published with Ruinart 'Acta Sanctorum Ordinis Sancti Benedicti' (1668–1702) and prepared the first four volumes of the 'Annales Ordinis Sancti Benedictini' (1703–39). A collection of his 'Ouvrages posthumes' appeared in 1724, and his 'Inedited Correspondence with Montfaucon, Magliabecchi, etc.,' was edited by Valery (1847). Consult Baackner, A., 'Mabillions Reise durch Bayern im Jahre 1863' (Munich 1910); Denis, P., 'Dom Mabillon en so Méthode historique' (Paris 1910).

MABINI, mä-bē'nē, Apollinario, Filipino insurgent: d. Philippine Islands, 1903. He was educated in the Catholic College of Manila, entered the public service under Spanish rule, became advocate of the treasury, resigned in 1896, and entered the insurrection. He was imprisoned for nine months by the Spaniards and then associated himself with Aguinaldo, Rizal and Agonchillo. Although a sufferer from paralysis he was the soul of the revolutionary movement and by many is considered the ablest man produced in the revolution. He became privy councillor of Aguinaldo and for a time was Minister of Foreign Affairs and chief of the Supreme Court in the latter's so-called government. In 1899 he surrendered to the United States, was sent into exile, but allowed to return in 1903 when he took the oath of allegiance. He was the brains of the Malolos government but opposed the Malolos constitution because he believed that the Islands needed a strong centralized government and also because it did not provide for a separation of Church and State. He was of the Tagalog tribe. Consult Worcester, Dean C., 'The Philippines, Past and Present' (2 vols., New York 1914) and 'Philippine Insurrection Records' in the Archives of the War Department, Washington, D. C.

MABINOGION, măb-ĭ-nŏ'gĭ-ŏn, The, the name generally but incorrectly applied to all mediæval Welsh stories. Of the general title 'Mabinogion,' which Lady Charlotte Guest's English version (1838–49) has made familiar, John Rhys gives an explanation. "An idea prevails," says Principal Rhys, "that any Welsh tale of respectable antiquity may be called a mabinogi; but there is no warrant for extending the use of the term . . . For, strictly speaking, the word mabinog is a technical term belonging to the bardic system, and it means a literary apprentice. In other words, a mabinog was a young man who had not yet acquired the art of

making verse, but who received instruction from a qualified bard. The inference is that the 'Mabinogion' meant the collection of things which formed the mabinog's literary training —his stock in trade, so to speak; for he was probably allowed to relate the tales forming the 'four branches of the Mabinogion' at a fixed price established by law or custom. If he aspired to a place in the hierarchy of letters, he must acquire the poetic art.' In Lady Charlotte Guest's later edition in one volume (1877),— the most convenient edition for reference,— 12 tales in all will be found. Of these, the most natively and characteristically Welsh in character are such tales as the vivid, thrice romantic 'Dream of Rhonabwy,' which owes little to outside sources. 'The Lady of the Fountain,' on the other hand, shows in a very striking way the influence of the French chivalric romances that Sir Thomas Malory drew upon so freely in his 'Morte d'Arthur.' In the admirably edited Oxford text of the Welsh originals by Rhys and Evans (1887-90), 'The Lady of the Fountain' appears under the title of 'Owain and Lunet'; and Lunet's name at once recalls Tennyson's 'Idylls of the King.' The old manuscript volume of the 'Mabinogion,' known as the 'Llyfr Coch o Hergest,'— the 'Red Book of Hergest,'— written in the dialect of South Wales, is in the famous library of Jesus College, Oxford, the one college in the older English universities which has a time-honored connection with Welsh scholarship and Welsh literature. The tales, though in their present form not older than the 12th century, embody traditions that were afloat prior to that date. Consult John, I. B., 'The Mabinogion' (London 1901); and Lloyd, E. J., 'The Mabinogion as Literature' (in the *Celtic Review*, Edinburgh 1911).

MABLY, Gabriel Bonnot de, gä-brē-ĕl bŏn-ō dē mä-blē, French ecclesiastic and publicist: b. Grenoble, 14 March 1709; d. Paris, 23 April 1785. His family name was Bonnot. Like his younger brother, the philosopher Condillac (q.v.), he was destined for the Church, and after studying at the seminary of Saint Sulpice in Paris was ordained subdeacon. He showed little liking for theology, and for some time was secretly employed in affairs of state by his relative Cardinal de Tencin, minister of Louis XV, conducting the most difficult negotiations and writing elaborate reports with an ability for which the minister received all the credit. Later he applied himself to literature, and in 1748 published his 'Droit publique de l'Europe,' which achieved a remarkable success. It was followed by 'Observations sur les Grecs' (1749); 'Observations sur les Romains' (1751); 'Entretiens de Phocion' (1753); 'Observations sur l'histoire de France' (1755); 'Principes des négociations' (1757); 'De la manière d'écrire l'histoire' (1773); 'De la législation' (1776); 'De l'Idée de l'histoire' (1778); and 'Principes de morale' (1784). Having been requested by the government of Poland to prepare for them a code of laws, he visited that country in 1771, and published in 1781 a work 'Du Gouvernement de la Pologne.' He was also consulted by the American Congress in 1783 on the preparation of the Constitution, and embodied his views in his 'Observations sur le gouvernement et les Lois des Etats-Unis d'Amérique' (1784). In this work he foretold the speedy downfall of the United States. He was an idealiser of ancient Rome and was enamored of the socialistic state and the communism of wealth, and from his pessimistic views on modern social organization was known as the "prophet of woe." Consult Guervier, 'L'Abbé Mably, moraliste et politique' (1886); de la Serae, 'Mabylet les physiocrates' (1911).

MABUCHI, mä-boo'chē, Japanese writer and religious teacher: b. 1693; d. 1769. He was distinguished as a scholar, and utilized his great learning in the endeavor to purify the native religion, Shinto, from the accretions of Chinese and Buddhist philosophy, etc., whereby he regarded it as having been corrupted. His love and knowledge of antiquity enabled him to present the native faith in its original simplicity, and his teachings were exemplified in his own life. To him modern students are largely indebted for direct access to ancient Japanese poetry. He added greatly to the knowledge of the past. He was the first of the three great scholars (Motoöri and Hirata being the others) who dedicated themselves to this work of simplifying the ancient faith of the country.

MABUSE, mą'bûz', **Jan,** Flemish painter: b. Mauberge, Hainault, in 1472; d. Antwerp, 1 Oct. 1552. His real name was Jean Gossart (or Gossaert). When he became a member of the Guild of Saint Luke at Antwerp in 1503, he signed the register as Jennyn van Henegouwe (John of Hainault). He signed his early pictures Jennyn Gossart and those of his middle and last period Joannes Malbodius (John of Mauberge). In the register of the Guild of Our Lady at Middleburg he is entered as Jan de Waele (John the Walloon). It is not known from whom he learned his art, but at Antwerp he fell under the influence of Quentin Matoys (15th century). In 1508 Mabuse, as he is familiarly known, went to Rome with his patron, the magnificent Philip of Burgundy, visiting Verona and Florence on the way. He stayed in Rome a year and returned to the court of Burgundy in November 1509. He then was employed at the Duke of Burgundy's castle of Zuytburg, painting for Philip. After Philip's death in 1524, he entered the service of Adolphus of Burgundy. When Christian II of Denmark visited the Low Countries he asked Mabuse to paint his dwarfs and in 1528 he requested the artist to design the tomb for his queen, Isabella, in the abbey of Saint Pierre, near Ghent. Mabuse also painted the children of Christian II — John, Dorothy and Christine, which came into the collection of Henry VIII of England. Mabuse also designed and erected the tomb of Philip of Burgundy in the church of Wyck. Van Mander's biography accuses him of habitual drunkenness, but the great works produced by him, as well as their number, prove that he was a hard-working and painstaking artist, perfectly in command of his powers. In 1527 he accompanied Lucas of Leyden on a pleasure trip to Ghent, Mechlin and Antwerp. Mabuse seems to have been the first of the Netherland painters to go to Italy. He brought back a new style; and from his time to that of Rubens and Van Dyck it was considered the proper thing for all Flemish painters to go to Italy.

The best specimen of his early and purely Netherland is the famous 'Adoration of the Magi,' long at Castle Howard, England, and purchased by the National Gallery, London, in 1911 for the extraordinary sum of $192,000. This great picture was painted in 1500 for the abbey of Grammont in eastern Flanders and was sold by the monks in 1605 to the Archduke Ferdinand, who placed it in a private chapel in Brussels. In the 18th century Charles of Lorraine acquired it and at his death in 1775 the picture passed to England. The signature of Jan Gossart appears in golden letters on the band of the crown on the negro king. In this great work there are 30 figures with an architectural background, much in the style of Memling and Roger van der Weyden.

The National Gallery (London) contains five other precious works by Mabuse, including the portrait of Jacqueline of Burgundy; portrait of a man holding his gloves and the portrait of a man with a rosary. Hampton Court has the 'Three Children of Christian II, King of Denmark'; 'Adam and Eve in Paradise'; a portrait of 'Holbein'; 'Eleanor of Austria'; and a 'Holy Family.' The Louvre has a magnificent portrait of Jean Carondelet, chancellor of Flanders; a 'Virgin and Child'; a portrait of 'Bénédictin'; and 'a man and his wife.' 'Saint Luke painting the Blessed Virgin and Child' formerly in the cathedral of Mechlin but now in that of Prague, painted in 1515, is a fine example of Italianized Netherland art. Another celebrated picture was a large triptych, 'The Descent of the Cross,' painted for Maximilian of Burgundy for the monastery of Our Lady and Saint Nicholas at Middleburg, which perished when that building was burned in 1568. Dürer saw it in 1520 and admired it extremely, although he said "the composition was not as good as the execution." Mabuse excelled in portraiture. Occasionally Mabuse turned to mythological subjects, such as 'Neptune and Amphitrite' (1516) in the Berlin Museum. His architecture is beautifully drawn and his painting of rich materials — damasks, embroideries and tapestries — is superb. Consult Segard, Achille, 'Mabuse, Jan' (in *Les Arts,* No. 123, p. 1, with illustrations including 'Adoration of the Magi,' Paris 1912); Weisz, Ernst, 'Jan Gossart' (Freis 1913).

MAC, or **MC,** a Gaelic prefix, as MacGregor, MacDonald, McKinley, etc. It corresponds with son in surnames of Teutonic origin, Fitz in those of Romance origin, or Ap or Ab in Welsh surnames.

MACA, a tribe of people living in the forests of the eastern slope of the Andes in central Ecuador. They live in huts of palm leaves, make pottery, hunt and cultivate yucca, corn and tobacco. The various tribes, not yet classified as to language, frequently war with one another. Their weapons are spears, blowguns and poisoned arrows. They dry the heads of slain enemies.

MACABEBE, mä-kä bā'bā, Philippines, a pueblo of the province of Pampanga, Luzon, situated at the head of the Pampanga River delta, nine miles from Manila Bay and seven miles southeast of Bacolor. Pop. 10,400.

MACABER (mą-kā'bėr) **DANCE.** See DANCE OF DEATH.

MACADAM, măk-ăd'ąm, **John Loudon,** Scottish engineer: b. Ayr, 21 Sept. 1756; d. Moffat, Dumfriesshire, 26 Nov. 1836. In 1770 he was sent to an uncle at New York, where he remained during the War of Independence, and realized a considerable fortune as agent for the sale of prizes. At the close of the war he returned to Scotland, and in 1798 was appointed agent for revictualing the navy in the western ports of Great Britain, and took up his residence at Falmouth. He afterward resided for many years at Bristol. It was here, in 1815, on being appointed surveyor-general of the Bristol roads, that he resumed experiments he had made in Scotland, and first had full scope for putting in practice the important improvements in road-making which had long before occupied his thoughts. By 1823 his general success was admitted; and in 1827 he was made general surveyor of roads. In carrying out his improvement he had expended several thousand pounds from his private resources; and the House of Commons, having been satisfied of the fact by the investigation of a committee, both reimbursed the actual outlay and presented him with an honorary tribute of £2,000, presenting to him a total of £10,000. His invention was rapidly introduced throughout the civilized world, and his own name was made synonymous with it.

MACADAM, a modern system of road-making invented by J. L. Macadam (q.v.), which consists in forming the roads out of hard materials such as granite, or basalt broken into pieces, none of which are too large to pass through an iron ring 2½ inches in diameter, and then deposited evenly in a bed of from 6 to 12 inches in thickness. The bed thus laid becomes perfectly compact and smooth, and in proportion as it is worn away or cut into ruts by traffic can easily be restored by a new coating of materials. See ROADS AND ROAD-MAKING.

McADOO, măk'ą-doo', **William Gibbs,** American jurist: b. near Knoxville, Tenn., 4 April 1820; d. 1894. He was graduated in 1845 from the East Tennessee University at Knoxville, sat in the Tennessee legislature 1845–46 and served in the Mexican War in 1847. He was afterward admitted to the bar and was attorney-general of the Knoxville judicial district, 1851–60. He removed to Georgia in 1862, served in the Confederate army during the Civil War and in 1871 became judge of the 20th judicial district of Georgia. He published a volume of poems and, with H. C. White, 'Elementary Geology of Tennessee.'

McADOO, William Gibbs, American cabinet minister and railroad official: b. near Marietta, Ga., 31 Oct. 1863. Descended from a distinguished Southern family, his father, Judge William Gibbs McAdoo, a jurist and soldier of the Mexican and Civil wars, became attorney-general of Tennessee some years after losing his wealth in the general devastation in the South caused by the Civil War. The subject of this sketch was educated at the University of Tennessee and admitted to the bar in 1885, notwithstanding that circumstances obliged him to leave the university in his junior year and earn his living as a clerk of the United States Circuit Court. He practised law in Chattanooga till 1892, when he came to New York and opened a law office. In 1898 he

formed a law partnership with Mr. William McAdoo (a native of Ireland and no relation whatever), who since 1910 has been chief city magistrate, and was formerly Assistant Secretary of the Treasury under President Cleveland. In his early days Mr. McAdoo had gained some practice in railroad work by running a street railway in Knoxville, an undertaking that proved a failure. His railroading propensities revived during his first years in New York City and he conceived the plan of tunneling the Hudson. With the aid and confidence of capitalists he succeeded in carrying that great undertaking to a successful issue. In 1902 he organized the New York and New Jersey Railroad Company (now the Hudson and Manhattan, of which he was elected president and director), and completed the Hudson tunnel scheme. He was vice-chairman of the Democratic National Committee in 1912, and in the following year Mr. Wilson, on his accession to the Presidency, invited him to take the office of Secretary of the Treasury. Mr. McAdoo severed his railroad connections and devoted himself to a task that was destined to become historic in the annals of national finance. The enormous financial transactions in which the United States government was involved owing to the European War are a matter of common knowledge. The raising of huge war loans and the financing of Allied belligerents were only the more conspicuous events of Mr. McAdoo's tenure of the Treasury. He was a leading architect of the Federal Reserve System and an active promoter of the Federal Farm Loan System. Throughout the vast network of national finance — taxation, distribution of government funds, war-risk insurance and the insurance of soldiers and sailors, economic problems of trade and agriculture, etc., Mr. McAdoo handled the complex ramifications and details with remarkable facility and judgment. When the United States government took over the entire railroads of the country in January 1918 Mr. McAdoo was appointed Director-General of Railroads. Up to the end of the close of the war he performed the duties of both offices — Treasury and Railroads. He tendered his resignation to the President on 22 Nov. 1918. Mr. McAdoo was married in 1885 to Miss Sarah Fleming of Chattanooga; she died in 1912, leaving three sons and three daughters. On 7 May 1914 he married Miss Eleanor Wilson, daughter of President Wilson.

McADOO, Pa., a borough on the Lehigh Valley and Pennsylvania railroads, five miles south of Hazleton and 78 miles northwest of Philadelphia. There are rich deposits of anthracite coal in the vicinity, and, consequently, coal-mining is one of the chief industries. Shirts are also manufactured here. In this borough of McAdoo are situated the picturesque Silver Brook Hollow and Tresckow water falls. Pop. 3,389.

McAFEE, măk'ă-fē, **Cleland Byod**, American clergyman: b. Fulton, Mo., 25 Sept. 1866. He was educated at Park College, Union Theological Seminary, New York, and Westminster College, Missouri. He was ordained a Presbyterian minister in 1888, and from that date to 1891 he was professor of mental and moral philosophy in Park College. In 1901 became pastor of the Forty-first Street Presbyterian Church, Chicago, which he held until 1904, when he became pastor of the Lafayette Avenue Church, Brooklyn. In 1912 he was made professor of didactic and polemical theology at the McCormick Theological Seminary, Chicago. He received the degree of Ph.D. in 1892. His books are 'Where He Is' (1898); 'Wherefore Didst Thou Doubt' (1900); 'Faith, Fellowship and Fealty' (1902); 'The Growing Church' (1903); 'The Worth of a Man' (1903); 'The Tenth Commandment' (1903); 'The Mosaic Law in Modern Life' (1906); 'Studies in the Sermon on the Mount' (1910); 'The Greatest English Classic' (1912); 'His Peace' (1913); 'Westminster Confession of Faith' (1914); 'The Old and the New in Theology' (1914), and 'Psalms of the Social Life' (1917).

McAFEE, Joseph Ernest, American clergyman: b. Louisiana, Mo., 4 April 1870. He is a brother of Cleland Boyd McAfee and was graduated from Park College in 1889, after which he studied in Union, Auburn and Princeton theological seminaries from 1889 to 1896. At Park College he taught Greek, the history of religion and ethics until 1906. In that year he became associate secretary of the Presbyterian Board of Home Missions of the Presbyterian Church in the United States of which he has been secretary since 1914. He has been engaged in educational work among recent immigrants. He has published 'Missions Striking Home' (New York 1908); 'World Missions from the Home Base' (1911); 'Religion and the New American Democracy' (1917).

MACAIRE, mă-kār **(Le Chevalier Richard)**, a French *chanson de geste* of the 12th century, and one of the great poems of the Middle Ages, the theme of which is the false accusation brought against the queen of Charlemagne, called Blanchefleur. *Macaire* is a fusion of two legends: that of the unjustly repudiated wife, and that of the dog that detects the murderer of his master. Macaire, a French knight, aided by Lieutenant Landry, murdered Aubry de Montdidier (q.v.) in the forest of Bondy. Montdidier's dog, named Dragon, showed such aversion to Macaire that suspicion was aroused and Macaire and the dog were summoned to a single combat. The result was fatal to Macaire, who died, confessing his guilt. Dragon was called the *Chien de Montargis* because the murder took place near the castle of Montargis. The encounter was depicted over the chimney of the great hall in the castle in the 15th century. *Macaire* is only preserved in the Franco-Venetian *geste* of Charlemagne (Bibl. St. Mark MSS. XIII), in a mixed form of French and Venetian dialects. It has been reprinted several times. Consult 'Macaire' (Paris 1866), ed. Guessard in the series of 'Anciens poètes de la France'; Paris, Paulin, 'Hist. litt. de la France' (Vol. XXIII, 1873); Gautier, L., 'Epopées françaises' (Vol. III, 3d ed., 1880); Paris, G., 'Hist. poét de Charlemagne' (1865). Jean de la Trille, 'Discours notable des duels' (Paris 1607), says the encounter with the dog took place under Charles V. The story was also told in another *chanson de geste* of the 12th century called 'La Reine Sibille,' which only exists in fragments. There are two French plays on the subject: one 'La Chien de Montargis' by Guilbert de Pixérécourt (1814), which was translated and played at Covent Garden, London (1814); and the other, 'Le chien d'Aubry.'

A manuscript in prose of 'Macaire' was found in the Bibliothèque de l'Arsénal in Paris about 1866.

MACAIRE, Robert, name of the villain in the French melodrama, 'Auberge des Adrets' (1823), in which Frédéric Lemaitre made his reputation. The character was modified by Lemaitre in his comedy 'Robert Macaire,' a sequel, in collaboration with Benjamin Antier. It was performed at the Theatre des Folies-Dramatiques, Paris, in 1834. In this, which Theophile Gautier calls "the great triumph of the revolutionary art" which followed the "Revolution of July," is expressed audacity and wit. It is an attack against social order. "Frédéric Lemaitre," says Gautier, "created in the personage of Robert Macaire a kind of humor that is almost Shakespearean. In it we find terrible gaiety, sinister laughter, bitter derision, pitiless raillery and a biting sarcasm, mingled with elegance, suppleness and astonishing grace. Robert Macaire and Bertrand are Don Quixote and Sancho Panza in crime." Consult Alhoy, Maurice, and Huart, L., 'Les cent Robert Macaire, composes et dessinés par H. Daumier' (Paris). Robert Louis Stevenson and W. E. Henley wrote a play 'Robert Macaire' (Stevenson's Works, Vol. XX). Consult *The New Review* (Vol. XII, p. 685).

McALESTER, mą-kăl'ĕs-tẽr, Miles Daniel, American general: b. New York, 1833; d. 1869. He was graduated from the United States Military Academy in 1856 and entering the engineer service became chief engineer of the Department of the Ohio in 1862. He served under Grant before Vicksburg and took part in the operations against Mobile.

McALESTER, Okla., city and county-seat of Pittsburg County. It is situated on two main trunk lines of railway — the Missouri, Kansas and Texas and the Chicago, Rock Island and Pacific railways, and has an interurban railway system that connects with the coal mines in the outlying district. McAlester is surrounded by rich agricultural land and stock-raising is an extensive business, thousands of cattle being shipped every year from McAlester. It is also the centre of the immense coal fields of eastern Oklahoma. Almost 50 companies are now operating in this new field with an annual output of 3,500,000 tons, all having their main offices in the city. McAlester also has extensive wholesale interests with an annual business of $6,000,000 in southwest Oklahoma, western Arkansas and northern Texas. The city has a high school, which cost $350,000, seven ward schools and two business colleges. The chief public buildings are the Busby Hotel, Federal Building, Masonic Temple, Mine Rescue Station and Busby Theatre. The Oklahoma State Penitentiary is located near the city. McAlester has the city manager form of government. Pop. 20,504.

MACALESTER COLLEGE, Saint Paul, Minn., a coeducational institution, founded in 1885 under the auspices of the Presbyterian Church. A four-years' college course leads to the degrees of bachelor of arts and bachelor of science, and a conservatory of music grants the degree of bachelor of music. The average annual enrolment of students is 360, and its faculty 38. Its total endowment is $558,000. It has seven buildings and total resources of $960,000. Its library has over 15,000 bound volumes. Its total income (tuition and endowment interest) is $60,806.

McALL (mą-käl') MISSION, a Protestant association founded in 1871 by Robert Whitaker McAll and his wife for religious work among the working people of France. On 17 Jan. 1872 the first station was opened in Belleville, one of the manufacturing suburbs of Paris. The work consists largely in striving to interest people in the questions pertaining to salvation of souls and then urging them to affiliate with some one of the nearby Protestant churches. No effort is made by the mission to establish churches, but some educational work has been begun in the large cities. Friends of the movement in America founded an American McAll Mission in 1883 with Philadelphia as headquarters, and there are also auxiliary societies in Great Britain and Canada. It was a McCall missionary who introduced the Boy Scout movement into France. During the Great War its agents served as chaplains and in other capacities, and its establishments were converted into hospitals. The expense of the work in France in 1916 was $60,000.

McALLISTER, Addams Stratton, American engineer: b. Covington, Va., 24 Feb. 1875. He was educated at the Pennsylvania State College and at Cornell University. In 1898 he became electrical engineer for the Berwind-White Coal Mining Company and in 1899 held a similar position in the Westinghouse Electric and Manufacturing Company. In 1901 he was assistant in physics in Cornell, instructor in 1902–03 and acting assistant professor of electrical engineering there in 1903–04. He also was lecturer on engineering at the Pennsylvania State College in 1909–14. In 1905 he became associate editor of the *Electrical World* and in 1912 was made full editor of this publication. In 1917 he became secretary of American Engineering Service of Engineering, a member of national lighting committee of the Advisory Commission of Council of National Defense and also a member of the War Committee of Technical Societies. In 1914–15 he was president of the Illuminating Engineering Society, afterward becoming its chairman and secretary. He is also president of the New York Electrical Society. Cornell gave him the degree of Ph.D in 1905. He is the inventor of alternating-current machinery. Dr. McAllister has contributed more than 100 articles on engineering to various technical journals and is the author of 'Alternating Current Motors' (1906; 3d ed., 1909), and 'Standard Handbook for Electrical Engineers' (1907). He is a member of a number of clubs and societies, including Engineers' Club of New York and the New York Southern Society.

McALLISTER, Ward, American society leader: b. Savannah, Ga., about 1830; d. 1895. He came of a family several of whose members were conspicuous at the bar. With his father, in 1850, he went to California, where he remained two years, and whence he removed to Newport, R. I., and afterward to New York City. Becoming possessed by marriage of a considerable fortune he was able, by means of influential connections through his mother and wife, to enter into social life with the advan-

tages of personal qualifications and family prestige. As a raconteur as well as an accomplished gourmet he had already attained prominence within a select circle when, by a well-turned remark, he became the leader of leaders in New York society, which, according to his strict limitation, included but 400 persons. The popular expression "The Four Hundred" originated from this assertion of McAllister's. He made contributions to the press, which, however, impaired rather than strengthened his unique position, as did also his volume 'Society as I Have Found It' (1890).

McALLISTER, Fort. See FORT McALLISTER.

MACALLUM, Archibald Byron, Canadian educator: b. Belmont, Ontario, in 1859. After receiving his education in the Toronto and Johns Hopkins universities he became lecturer on physiology (1887) and professor in the medical faculty of Toronto University (1891–92). From 1892 to 1901 he was associate professor in the arts faculty there and full professor after 1901. In 1895–97 he was president of the Canadian Institute. In 1901 he was made a Fellow of the Royal Society, Canada, and in 1906 of the Royal Society of London. In 1911 he was elected president of the American Society of Biochemists. He has published scientific articles in the *Journal of Physiology, Proceedings of the Royal Society Quarterly Journal of Microscopical Science, American Journal of Morphology* and *Journal of Anatomy and Physiology.*

McALPINE, mă-kăl'pĭn, **William Jarvis,** American engineer: b. New York, 1812; d. New Brighton, Staten Island, N. Y., 16 Feb. 1890. He took up engineering in 1827 under J. B. Jervis, with whom he continued till 1839, and succeeded him as engineer of the Erie Canal enlargement. In 1851 he became State engineer of New York and State railroad commissioner in 1855–57. He was subsequently engineer of several important railways, constructed the city waterworks at Albany and Chicago, and in 1870 his plans for improvement of the cataracts of the Danube were accepted by the Austrian government. While engineer of the department of parks, 1879–80, he constructed the Riverside drive in New York.

McANENY, George, American civic administrator: b. Greenville, N. J., 24 Dec. 1869. He was graduated at the Jersey City High School in 1885 and entered journalism, serving on the staff of several New York newspapers from 1885 to 1892. From 1892 to 1894 he was assistant secretary of the Civil Service Reform League, of which he became secretary in 1894. He held this position until 1903, serving on committees that drafted the municipal home-rule section of the State constitution in 1894 and the State Civil Service Law in 1899. In 1902 he was a member of the New York Civil Service Commission and also of the commission to revise the city charter in 1908. In 1903–06 he read law with Edward M. Shepard. In 1906–09 he was president of the City Club of New York; in 1910–13 he was president of the borough of Manhattan, and in 1914–16 president of the board of aldermen (fusion ticket), and was active in obtaining municipal markets for New York City. In 1902 he drafted the civil service rules now in force in New York City; was a member of the commission appointed by the governor to revise the New York City charter (1908); chairman of the transit committee of the New York board of estimate and apportionment, which, with the Public Service Commission, developed New York's new $300,000,000 subway system, and chairman of committee on city plan 1914–16. In national politics he is a Democrat. In 1913 Paris gave him the medal of the Société des Architects Diplômes par le Gouvernment Français for services to city planning and architecture in the United States. In 1915 he received the medal of the Architectural League in New York. Hobart gave him the degree of LL.D. in 1914. He is chairman of board of trustees of College of the City of New York; a trustee of the Tuskegee (Alabama) Institute and of Jeanes Fund for Negro Education; vice-president Hampton Association National Municipal League, and president of the New York Kindergarten Association. In 1914 he was Dodge lecturer at Yale. The lectures were published under the title of 'Municipal Citizenship' (New York 1915).

MACAO, mă-kow' or mă-kā'ō, China, a Portuguese settlement and seaport on the west shore of the mouth of the Canton River, 40 miles west of Hongkong. It occupies a high peninsula, formerly the island of Macao, but now united by a narrow isthmus north of the town with the island of Hiang-shan, and, with the small islands of Taipa and Calōane, forms a province. The settlement is about eight miles in circuit, and its limits landward are defined by a barrier wall stretching across the isthmus, where a guard of Chinese troops is stationed to prevent foreigners from trespassing on the Inner Land. The town occupies a slope gradually descending to the sea, backed by a range of lofty hills, and having an extensive plain stretching east. It is nearly surrounded with water, and is open to the sea-breezes on every side. The houses occupied by the foreign population are large, roomy and open, and the shops are numerous. The city is divided into two wards, one inhabited by Chinese and the other by non-Chinese, each with its own administrator. The quay or "Praya Grande" is commodious, forms a pleasant drive and is protected by a battery. The harbor is formed between the peninsula on which the town stands and the large island of Twee-lien-shan, to the west. Macao is considered the healthiest residence in southeast Asia with a mean annual temperature of 74°. Near it, in a beautiful garden, is the grotto in which the poet Camoens is said to have finished the 'Lusiad.' The principal exports are tea, cassia and cassia oil, anise and anise oil and opium. The commerce (mainly in the hands of the Chinese), which is chiefly carried on with Hongkong, Canton, Batavia and Goa, has greatly declined since the opening of the rival free ports, and a considerable part of the colonial revenue is drawn from a tax on the gambling tables for which Macao is notorious. In 1913, 4,110 merchant steamers entered, with a gross tonnage of 1,008,814 tons, and 13,389 junks, totaling 303,764 tons. The Portuguese first obtained permission to form a settlement and to trade at Macao in 1557. From 1563 they were required to pay a yearly tribute to the Chinese government, and their trading privileges were much restricted

till 1844, when they were allowed to carry on commerce with the five ports then open to foreigners. Macao was then declared a free port, but the Chinese continued to ignore the territorial claims of the Portuguese until 1887, when a treaty was concluded. Macao from its convenient situation was the place of retreat for European merchants and missionaries when threatened by uprisings of race or religious feelings in China. Robert Morrison, the first Protestant missionary in China, was buried here. Pop. about 74,866 (2,171 Portuguese).

MACAPA, mä-kạ-pä, Brazil, town on the delta of the Amazon, 110 miles from the mouth of that river. It has a fine harbor with fortifications. The exports are chiefly timber and fine woods for the furniture trade. Pop. 4,000.

MACAQUE, mạ-käk', one of the small, short-tailed Asiatic monkeys of the genus *Macacus* and family *Cercopithecidæ,* which are so docile, intelligent and interesting as a rule that they are common in menageries and frequently kept as pets; their gentleness and playfulness disappears as they grow old, however, and they are then likely to become morose and savage. They go about in troops, keeping by themselves, and differing from other monkeys in most of their actions and cries. Some of the best known are the quaintly crested capuchin or bonnet-monkey (*M. sinicus*), excessively common and pestiferous in southern India; the entellus monkey (q.v.) of northern India; the large pig-tailed (*M. leoninus*) of Japan, whose likeness is seen in numberless Japanese drawings and carvings. Ranging over so wide a variety of countries their habits and food differ greatly. Besides the fruit, juicy leaves and insects eaten by most monkeys they devour small reptiles, young birds, frogs and crabs, the last-named forming the principal diet of a Malayan species (*M. cynomolgus*). One species is isolated in the mountains of Algeria and Morocco, whence they were long ago carried, no doubt, to the island of Gibraltar, where they are known to the English of the garrison as "Barbary apes" (*M. inuus*), and the small band upon the Rock are carefully protected from harm.

MACARONI (Ital. *maccheroni*), a peculiar paste or dough prepared from wheat flour and manufactured into tubes or ribbons. It is an Italian invention, and, though made by a simple process, has never been produced with so great success in any other country. The grain grown in the more southern countries of Europe is said to possess a greater amount of gluten, and is therefore better adapted to this manufacture. The wheat, after being washed, is freed from the husks and ground in water mills, when hot water is added till it is of the consistency of stiff dough. Five different qualities of flour are obtained by an equal number of siftings, the last giving the finest and most delicate that can be made. To reduce the dough to tubes or ribbons a hollow cylindrical cast iron vessel is used, having the bottom perforated with holes or slits. When this is filled with the paste a heavy iron plate is driven in by a powerful press, which forces the paste through the holes and gives it the shape of the perforations, the workman cutting off the pieces of the desired length as they come through. During this process it is partially baked by a fire made under the cylinder. Sometimes the flat pieces are formed into tubes by uniting the edges before they are thoroughly dry. After being hung up for a few days they are ready for use. The largest tubes are called *maccheroni,* the smaller *vermicelli* and the smallest *fedelini.* Macaroni is prepared for the table by boiling and baking with grated cheese, and is in common with vermicelli and the other varieties much used in the preparation of soups. Since about 1880 the use of macaroni in the United States has largely increased, and where it was once only consumed by Italians in this country, it is now eaten by all classes. Numerous macaroni factories have been established in New York and elsewhere. The United States imports annually from Italy over 500,000 boxes of macaroni.

MACARONIC VERSE, a kind of facetious poetry in which foreign words are distorted and jumbled together; so called by Teofilo Folengo, a Mantuan monk of noble family, who published a book entitled 'Liber Macaronicorum,' a poetical rhapsody, made up of words of different languages. His principal poem was called macaronic, because it was mixed up of Latin and Italian, as macaroni is mixed up with cheese. Consult Morgan, 'Macaronic Poetry.'

MacARTHUR, Arthur, American soldier: b. Springfield, Mass., 2 June 1845; d. Milwaukee, Wis., 5 Sept. 1912. Having enlisted in the United States volunteer service in Wisconsin he served through the Civil War period, being promoted lieutenant-colonel and brevet-colonel in May 1865, for gallant and meritorious conduct in the battles of Perryville, Ky., Stone River, Tenn., Mission Ridge and Danridge, Ga., Franklin, Tenn., and in the Atlantic campaign. He was mustered out of the volunteer service in June 1865 and entered the regular army with the rank of lieutenant in the 17th United States Infantry the following year. In the Spanish-American War he was appointed a brigadier-general of volunteers and assigned to the Philippine expeditionary forces. He was promoted brigadier-general in the regular army, 2 Jan. 1900; commanded the Military Division of the Philippines, major-general U. S. A., 1901, and lieutenant-general, 15 Sept. 1906. He returned in 1901, and in 1902 commanded the Eastern department, 1902–03 the Lakes, 1903–04 of California, and 1904–07 the Pacific division. He was retired by operation of law 2 June 1909.

MacARTHUR, Duncan, American pioneer: b. Dutchess County, N. Y., 14 June 1772; d. Ohio, 1839. His family removed in 1780 to the western frontier of Pennsylvania, and at 18 years of age he went to seek his fortune in the wilderness, and participated as a ranger or scout in the warfare with the Indians in Kentucky and Ohio, until the victory of General Wayne in 1794 gave peace to the Western country. About the commencement of the present century he settled in Ohio as a surveyor, and in 1805 became a member of the Ohio legislature, and was appointed major-general of the territorial militia. In the War of 1812 he received the commission of brigadier-general in the army, and succeeded General Harrison in 1814 in command of the army of the West. After the peace, as a joint commissioner with General Cass, he negotiated the treaty with the Indians of Ohio for the sale of their lands in that State,

which was ratified in 1818. He served again in the Ohio legislature 1815–21, and in 1823–25 was a representative in Congress from that State. In 1830 he was elected governor of Ohio.

MacARTHUR, Robert Stuart, American Baptist clergyman: b. Dalesville, Quebec, 31 July 1841. He was graduated from the University of Rochester, N. Y., in 1867, and from the Rochester Theological Seminary there in 1870, and from May 1870 to September 1911 was pastor of Calvary Baptist Church, New York, when he resigned, having been elected president of the Baptist World Alliance. He went to Russia to secure from the Tsar's government permission to buy land on which to erect a Baptist Bible College. He later went to Burma as president of the Alliance to assist in celebrating the centennial anniversary of Adoniram Judson's mission work in Burma. He was for a long period connected editorally with the *Christian Inquirer* and *Baptist Review*, and has lectured on foreign travel. His publications include 'Calvary Pulpit'; 'Current questions for Thinking Men'; 'Lectures on the Land and the Book'; 'Around the World'; Old Testament Difficulties'; 'Advent and Other Sermons'; 'Royal Messages of Cheer and Comfort'; 'The Christic Reign'; 'The Old Book and the Old Faith'; 'Divine Balustrades'; 'The Celestial Lamp'; 'The Question of the Centuries,' and 'Quick Truths and Quaint Texts.'

MACASSAR, Celebes, the capital of a district of the same name in the island of Celebes on the west coast of the southern peninsula near the southern end of Macassar Strait separating Celebes from Borneo. It is the chief town of the Dutch government of Celebes. Macassar consists of the Dutch town and port, Vlaardingen, where the governor of Celebes resides, and the Malay town, which lies inland. The Portuguese claim to have visited Macassar in 1512; but there was no permanent Portuguese settlement until the 17th century when the English and Dutch also appeared on the scene. In 1660–68 the Dutch, after decisive victories on land and sea, succeeded in driving the Latins from Celebes and establishing themselves. All attempts of the English to supplant the Dutch were unsuccessful and the Dutch have been masters for two centuries and a half, with the exception of one short period of British occupation in the early 19th century. The important buildings are the official residence of the governor of Celebes; the new museum, containing a valuable collection of objects illustrative of the native arts and industries, arms, armor, costumes, choice fabrics and jewelry; and Fort Rotterdam, a relic of the time of Portuguese supremacy and its capture by the Dutch. "Aside from the military forces quartered in Fort Rotterdam," writes A. S. Walcott, "Macassar has a population of about 27,000, including about 1,000 Europeans and 5,000 Chinese; but so many of the inhabitants live in the outlying *kampongs* to the north and south of the city proper, that it is hard to realize that the figures have not been greatly exaggerated. The houses of the *kampongs* vary in many details from those to which we have become accustomed in Java. They are generally raised several feet above the ground on poles, and have gabled roofs, shuttered windows and considerable ornamentation in the way of carved woodwork. The walls are of matting or of neatly plaited bamboo, the roofs of *nipa*, or palm-leaf thatch. The people of this southern end of Celebes are nearly all either Macassarese, or Bugis. They resemble the Javanese in face and figure, but are more sturdily built and are decidedly less polite and pleasing in bearing and manners. The Bugis are the seamen of the Archipelago, the greatest navigators and the most enterprising traders to-day and in times gone by the greatest pirates as well. All the people of the coast districts of southern Celebes are in religious proclivities Mohametan-Animists — Mohametans in their profession of faith, Animists and fetish-worshippers in their practices." Macassar trades in coffee, rice, copra, trepang, spices, gum, rubber, pearls, mother-of-pearl, cocoa oil, maize, sandal wood and valuable timber. Pop. about 27,000. Consult Gervaise, N., 'Description historique du royaume de Macaçar' (Ratisbon 1700); Walcott, Arthur S., 'Java and her Neighbors' (New York 1914).

MACASSAR OIL, the trade name for an unguent that made its appearance in England early in the 19th century, manufactured by one Rowland. It took its name from the district of Macassar, where it was first produced, being pressed from the fruit, or seed, of the *Schleichera trijuga*, the East Indian kusum tree. This fixed vegetable oil is used by the natives for cooking, illuminating and for medicinal purposes. The name is now given to a pomade made of almond, olive or peanut oil, to which other substances are added to give color and perfume. The original Macassar oil became so well known that Byron spoke of it as "Thine incomparable oil, Macassar," and Lewis Carroll alludes to it in the Song of the Man sitting on the Gate in 'Alice Through the Looking-glass.' So general was its use that in England a covering was specially made to throw over the back of a chair or sofa as a protection from the grease in the hair; and to these coverings the name Anti-macassar was given. Anti-macassars were at first made of white cotton in crochet-work. They were stiff, hard and uncomfortable; but in the third quarter of the 19th century they were simpler and were more artistically worked in colored wools or crewels, or colored silks in pretty patterns. The *Lady's Newspaper* (1852) describes anti-macassar materials as "crochet cotton," "pink and drab crochet twine," etc. *All the Year Round* (1879) "the anti-macassar on the arm chair"; and Miss Braddon's 'Vixen' (1879) "To sit alone by the fireside and work anti-macassars in crewel" shows that the word was still familiar in England to a comparatively recent period. In the United States the word "tidy" was used to describe the article.

MACAULAY, ma-kâ'lĭ, **Catharine Sawbridge,** English historian: b. Wye, Kent, 2 April 1731; d. Binfield, Berkshire, 22 June 1791. In 1760 she was married to George Macaulay, a London physician. She was an ardent Republican and a great admirer of Washington, with whom she corresponded, and whom she visited in 1785. She published a 'History of England from the Accession of James I to the Revolution' (8 vols., 1763–71), once very popular and eulogized by Pitt in the House of Commons, but now neglected.

MACAULAY, James, Scottish novelist: b. Edinburgh, 22 May 1817; d. there, 20 June 1902. He was educated at the University of Edinburgh and for 35 years was in the service of the Religious Tract Society as editor-in-chief. In 1851–57 he was joint editor of the *Literary Gazette* and in 1858 became editor of the *Leisure Hour Sunday at Home. The Boy's Own Paper* and *The Girl's Own Paper* were founded by him. He was a voluminous writer, and among his published works the following may be mentioned: 'Across the Ferry; First Impressions of America and its People' (1871); 'Memory Helps in British History' (1873); 'All True: Records of Adventure' (1879); 'Luther Anecdotes' (1883); 'Gordon Anecdotes' (1885); 'Livingstone Anecdotes' (1886); 'Wonderful Stories of Daring, Peril and Adventure' (1887); and 'Victoria, Her Life and Reign' (1887).

MACAULAY, Sir James Buchanan, Canadian jurist: b. Niagara, Ontario, 3 Dec. 1793; d. Toronto, 26 Nov. 1859. He was an ensign in the British army during the War of 1812, and subsequently studying law was admitted to the bar in 1822. In 1829 he was appointed a judge of the King's Bench, from 1849 to 1856 he was chief justice of the Court of Common Pleas, and just prior to his death became judge of the Court of Error and Appeal. He was knighted in 1859.

MACAULAY, Thomas Babington, English essayist, historian and statesman: b. Rothley Temple, Leicestershire, 25 Oct. 1800; d. Holly Lodge, Kensington, 28 Dec. 1859.

Macaulay was the son of Zachary Macaulay, a Scotchman of remarkable character, who achieved distinction by his life-long advocacy of the abolition of slavery and by his efficiency, as a young man, in the governorship of Sierra Leone, the colony of African freedmen. The family removed to Clapham, then a suburb of London, where much of Macaulay's youth was spent. Hannah More was a friend of the family and she encouraged the lad as a writer and presented him with books to start his library. Young Macaulay was regarded as a prodigy, and his memory was something startling. He attended school near Cambridge under a Mr. Preston; his range of reading, particularly in poetry and fiction, was immense, but his taste for mathematics and the exact sciences steadily declined. In October 1818 he entered Trinity College, Cambridge, and in the citadel of mathematics his aversion for this study became pronounced. Twice he gained the Chancellor's medal for poetry, and he displayed classical attainments, but was "gulphed" in mathematics. However, after a third trial, he won a Fellowship in 1824. His mental training was thus one-sided; and a certain lack of philosophical grasp and a dislike of facing abstruse intellectual problems became thus characteristic.

The association with his college mates, rather than his studies, left the deepest impression upon Macaulay. His great friend was Charles Austin, whose influence converted the young Tory into an uncompromising Whig. He shone in the Union Debating Society, developing powers that afterward became conspicuous in the House of Commons. Politics he had heard discussed from early childhood in the circles which gathered round his father's table, and along with literature politics was his abiding passion. At college he had competed for a prize in history on the subject which he developed fuller in later years: "The Conduct and Character of William III."

Before leaving the university he began writing for publication in *Knight's Quarterly Magazine* (1823). Two lyrics, 'Ivry' and 'Naseby' still live; but the most important contribution was the ingenious 'Conversation between Mr. Abraham Cowley and Mr. John Milton, touching the great Civil War.' It seems likely enough that the freshness and delicacy revealed in this early work became injured by the author's entrance into the rougher world of political strife. On the other hand, it may be maintained that Macaulay's gifts were preeminently those of the man in public life, and to him literature, always a delight, was nevertheless really but an avocation.

Macaulay's father unexpectedly became financially involved. Full of courage, the son began tutoring while still at Cambridge, and cheerfully assisted in supporting his sisters. Ultimately, together with his brother, he paid off all his father's obligations.

Macaulay was called to the bar in 1826 and joined the Northern circuit; but soon gave up the law for politics. Interestingly enough, his entrance into politics came by way of literature. In August 1825 appeared the essay on 'Milton,' the first of the series that Macaulay contributed to the *Edinburgh Review,* which, for the next 20 years, made both him and the *Review* famous. Jeffrey, the editor, expressed his frank wonder as to where Macaulay "picked up that style." Upon Jeffrey's resignation Macaulay was offered the editorship, but he was not willing to leave London. Papers on 'Machiavelli' (1827), 'Dryden,' 'History' and 'Hallam's Constitutional History' (1828), followed, and soon after controversial articles on James Mill, Sadler and Southey, which revealed the declared Whig. Their reputation introduced him into both social and political life. He was made commissioner of bankruptcy in 1828 and in 1830, Lord Lansdowne, who had been favorably impressed by the attack on Mill, offered Macaulay a seat in Parliament for Calne in Wiltshire which he held until in 1832 he was elected for Leeds.

His time of entrance into the House of Commons was propitious. It was just before the death of George IV and the accession of William IV, and consequently on the eve of the battle for the reforms of 1832. Macaulay was 30 years of age, was widely read in history and literature and was a ready and fluent speaker aflame with interest in public questions. In 1824 he had made a notable speech at a meeting of the Anti-Slavery Society; later, in the discussion for Catholic emacipation, he headed a coachload of M.A.'s from London to Cambridge, arriving in time to vote down a petition in the university senate against the act. He now threw himself ardently into the struggle for reform and took an honorable part in the fight from begininning to end. His Parliamentary success was immediate. "Whenever he rose to speak," Mr. Gladstone testified, "it was a summons like a trumpet-call to fill the benches." His earliest effort was on the removal of the civil disabilities of the Jews, which he followed by an essay on the subject in the

Edinburgh Review (January 1831). On the emancipation of slaves in the colonies he never wavered, but stood unflinchingly true to his father's principles. He offered to resign his position with the ministry rather than yield his views on this subject; but the question was satisfactorily settled and his resignation not accepted.

Meanwhile he found time to write. The essays on 'Byron, 'Johnson' and 'Hampden' appeared in 1831; 'Burleigh' and 'Mirabeau,' in 1832; 'War of the Succession in Spain' and 'Horace Walpole,' in 1833, and the first essay on 'Chatham,' January 1834.

His appointment in 1832 as a commissioner of the Board of Control was followed by absorption in East Indian affairs, and in 1833, when the charter of the East India Company was renewed, he was offered a position on the East Indian Council with a salary of £10,000 per annum for five years. His brilliant career in Parliament was seemingly permanently endangered; but Macaulay did not hesitate. He estimated that he could save half his salary and in five years have a competence. He needed money on account of his father's poverty, for the sake of his two sisters, as well as for his own career; and he accepted, going out in 1834 and returning in 1838. The genius for government which the father had displayed at Sierre Leone, the son now manifested at Calcutta. His important permanent reforms were the creation of the Indian Penal Code and the Code for Criminal Procedure, achieved in the face of bitter local opposition, and the organization of a sound educational system.

Macaulay's family ties were very strong and there is no record of any love affair in his life. A sister, Jane, had died in 1830, and his mother in 1831. One of his favorite sisters, Margaret, was married in 1832, an occurrence which he accepted as a source of personal distress. The other, Hannah, accompanied him to India, and there she met and was shortly married to Charles Trevelyan, an officer in the government service. Macaulay was much pleased with the match, and the two households lived together under the same roof. Ever afterward, as the young Trevelyans, his nieces and nephews, grew up, they became a very real part of Macaulay's life. His love for children, and particularly for these, was a marked trait, and one of them afterward filially wrote his uncle's biography. Meanwhile his sister Margaret had died in England, and likewise his father died while Macaulay and the Trevelyans were on their homeward voyage. These deaths affected him deeply, and the home-coming was a sad one.

While in India he made opportunity for an immense amount of reading, particularly of the Latin and Greek classics, to which he returned with increasing delight. He also read widely in Italian and French, and did some German on the return voyage. His love for the great poets, dramatists, orators and historians affected his culture, his style and his ideals. The lists of his reading from now to the end of his life became a part of his biography and would stock a good library. His long walks with a copy of Homer or Virgil, from which he was reading or spouting, became an accustomed sight. Thenceforward he determined that he would write a history in emulation of Thucydides and Tacitus and Livy, and his set speeches caught something of the spirit of Lysias and Cicero.

Upon his return to England he left for a tour in Italy, revelling in its beauties and associations with the enthusiasm of a first visit and the eye of an historian and student of Latin and Italian literatures. The literary fruits were the 'Lays of Ancient Rome.'

Returned home, he sincerely hoped to begin his 'History of England,' which he had planned to write from the Revolution of 1688 to the death of George III. Had he begun it then, with 20 years of life to devote to it, he might easily have left 10 or more volumes covering the century instead of the first five extending through but 15 years — a brilliant fragment. But he was again dragged into politics and Macvey Napier, editor of the *Edinburgh Review,* made heavy draughts upon his time.

In India he had contributed but two essays to the *Review,* that on 'Mackintosh's History' and the very long one on 'Bacon.' However, his experience furnished him the material for the brilliant narratives on 'Clive' (1840) and 'Warren Hastings' (1841). Besides these in the six years after his return he contributed 'Sir William Temple' (1838) — written in an entirely fresh spirit; 'Gladstone on Church and State' (1839); 'Von Ranke's History of the Popes' (1840); the 'Comic Dramatists of the Restoration' and 'Lord Holland' (1841); 'Frederick the Great' (1842); 'Mme. d'Arblay' and 'Addison' (1843); 'Barère' and the second essay on the 'Earl of Chatham' (1844). This, perhaps his noblest essay, proved to be his last. He was forced to give up writing in order to find time for his 'History.' His complaisance in continuing to write for the *Review* had undoubtedly worked to his detriment. But the entrance into politics was only in part due to the exigencies of his friends; for public life exercised a subtle fascination over him.

In 1839 he was elected member of Parliament for Edinburgh and was made Secretary at War with a seat in the Cabinet. Fortunately the ministry soon expired, and his freedom from official duties gave him some leisure. He retained, however, his seat for Edinburgh, and his most important work was the Copyright Bill, which, after many radical suggestions, passed in almost the exact terms in which he advocated it.

In 1842 the 'Lays' appeared and achieved a great success despite the natural fears of friends. "Christopher North" of *Blackwood's,* who had attacked Macaulay on account of the Southey reviews, made up — on poetry they could agree. In 1843 the 'Essays' were collected and published. There had been a constantly growing demand for them in a permanent form, which their author at first resisted. They had been written at odd moments of leisure, and he regarded them as ephemeral, but copies were being introduced from America, and Macaulay had to consent. The sale proved their popularity to be a permanent one. Macaulay's Essays still are unapproached of their kind, as condensed booklets of knowledge. An analysis of their contents shows how their author's mind was revolving constantly upon a definite period of English history — the Revolution and the consequent development under constitutional government, the subject he set

for himself in writing his 'History'— and these are uniformly among his best. Those on foreign subjects and the controversial ones are less satisfying.

The 'History' had been delayed year after year for lack of leisure to begin actual work. At length the first two volumes appeared in 1849. They comprised the reign of James II and the Revolution, but reproduced the setting as a whole and included details at once picturesque and dramatic such as could only be drawn by a supreme master of narrative. Macaulay had set for himself high ideals; he wished to be read and to be understood; he sought to give a series of brilliant mental pictures; and he achieved what he set out to do. He is weakest, perhaps, on the side of ethical interpretation, in searching out the causes and setting forth the nexus of events; his narrative is brilliant and effective, but it has the supreme fault in a history of being entirely lacking in detachment of view. In opinions he represented the great middle class and the world of Whiggism and its mode of thinking; in many things, Philistine; in some things, even vulgar; where mysticism and all esoteric systems of philosophy and kindred schools of poetry were accounted as foolishness.

The popularity of the 'History' was something enormous, surpassing even that of Byron's poems and of Scott's and Dickens' novels. In 1849, in consequence of this success, Macaulay was made rector of the University of Glasgow and Fellow of the Royal Society. He had been appointed trustee of the British Museum in 1847. He declined a professorship of history at Cambridge, and steadily refused positions under the government which would take up his time.

He had represented Edinburgh in Parliament for eight years, when in 1847, on account of his characteristic independence in voting for the Maynooth grant — for the maintenance of a Catholic university in Ireland — he offended many Edinburgh electors, and was not returned at the polls. He accepted his defeat with relief, and turned the more eagerly to the 'History.' In 1852, without any solicitation on his part and with a steady refusal to give pledges, he was returned voluntarily by the electors of Edinburgh to his former seat. Under such circumstances he felt he could not refuse election; but the duties it involved aided in sapping his strength, and that year he had a spell of illness from which he never wholly recovered.

In 1853 his speeches were collected and published. In 1855 the third and fourth volumes of his 'History' appeared. Macaulay feared for their success after the splendid reception accorded to the former two; but the new subject was the life and career of William of Orange, his favorite hero, he had worked hard to sustain himself and 26,500 copies were sold in 10 weeks. In 1856 he withdrew from the House of Commons; and in 1857 he was made a peer, and chose the title, Baron Macaulay of Rothley, from his birthplace. Likewise this year he was made a foreign member of the French Academy, member of the Prussian Order of Merit and high steward of Cambridge. In 1858 he wrote five short biographies for the eighth edition of the Encyclopedia Britannica — Atterbury, Bunyan, Goldsmith, Johnson and Pitt. These show greater compactness and maturity in judgment than his earlier treatment of the same themes.

In 1856 he left his bachelor quarters in town, at The Albany, and leased a pleasant villa, Holly Lodge, Campden Hill, Kensington. In 1859 his brother-in-law, now Sir Charles Trevelyan, was appointed governor of Madras, and the thought of the separation bore heavily upon him. Fortunately his sister and the children remained behind a while longer. Macaulay had not been well for some time, and he died at Holly Lodge, 28 December. On 9 Jan. 1860, he was buried in Westminster Abbey in the Poets' Corner at the foot of Addison's statue.

A fifth volume of the 'History,' concluding the reign of William III, had been completed, was edited posthumously by Lady Trevelyan and appeared in 1861. See MACAULAY'S ESSAYS; LAYS OF ANCIENT ROME.

Bibliography.— The official life, written by George (afterward Sir George) Otto Trevelyan (his nephew), appeared in London in 1876, and is generally conceded to be one of the best biographies in the English language. Consult also Lord Avebury, 'Essays and Addresses' (London 1903); Bagehot, Walter, 'Literary Studies' (ib. 1879); Canning, 'Lord Macaulay and his History' (ib. 1822); Hughes, D. A., 'Thomas Babington Macaulay the Rhetorician: an Examination of his Structural Devices' (Ithaca, N. Y., 1898); Macgregor, D. H., 'Lord Macaulay' (London 1901); Viscount Morley, 'Critical Miscellanies' (ib. 1877); Morrison, J. Cotter, 'Macaulay' in the 'English Men of Letters' (ib. 1882); Spedding, 'Evenings with a Reviewer' (ib. 1881).

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MACAULAY'S ESSAYS. Macaulay did not originate the essay of literary and historical criticism. But Macaulay's essays so far surpass all others in brilliancy, style and solidity of matter that his name ranks with those of Bacon and Montaigne, each a master in his own special field. Macaulay's first published articles, written while he was still in residence at Cambridge University, appeared in Knight's *Quarterly Magazine* in 1823 and 1824, and from that time until his death in 1859 he wrote two score essays for the *Edinburgh Review* and many articles for the 'Encyclopædia Britannica.' The subjects he wrote upon were many — Dante, Dryden, Mill on Government, Mr. Robert Montgomery's poems, Moore's Life of Byron, Lord Bacon, Von Ranke, Leigh Hunt, Frederick the Great, Madame d'Arblay, Barère, etc., but by far the greater number deal with poets and men of letters or political personages in English history. Perhaps his most famous essays are those on Lord Clive, Warren Hastings and William Pitt, but others that deal with men of letters, Addison, for instance, or Samuel Johnson, are just as brilliant.

Macaulay's essays are set off by all the arts of rhetoric; they are ornamented by all the resources of omnivorous reading and a marvelous memory; they sparkle with a youthful enthusiasm, and are compact of sound information. In their own class they have no rivals. They are books to be taken on a long sea voyage, to be put on the shelf of a lonely ranchman, to be read and reread by all who have any taste for

literature. Pick up the essay on Addison and you are delighted with the tender sympathy of the critic who can set forth a good man's character in so generous and beautiful a manner. Read that on Croker's edition of 'Boswell's Johnson,' and you not only derive pleasure from Macaulay's admiration for Johnson, but you also get a lively idea of what the editor of a biography should not do. Take up any essay you please and you find knowledge, wit, sympathy, admiration; you are delighted to find with what extraordinary ease you acquire information, and how your horizon rapidly reaches out as if you were going up in a balloon, how places and things once so dark become enveloped in light as if the sun were rising, how great historical events seem to have been familiar to you from boyhood and how eminent personages, hitherto unknown, leap into your sudden intimacy.

Thus to delight, in form, and exhilarate the reader is a wonderful feat, and for nine men out of 10 Macaulay's essays are wholly satisfactory. They give a busy man what he wants to get from history and literature; but the 10th man finds himself not wholly satisfied. He feels oppressed by the arts of rhetoric. These animated pages, paragraphs, sentences that advance upon him, rank by rank, marshaled according to the most brilliant rules of tactics and strategy, trouble his spirit. Not a single sentence, here or there, appears in undress uniform. Such prose affords no room for subtleties. And the author's dogmatism rings in our ears like a trumpet in a room; this world of ours so full of perplexities, uncertainties, obscurities, cannot be truly expressed in opinions of absolute definiteness. History, literature, art, are not mathematics; a column of figures adds up the same for all; but William of Orange, James the Second, Archbishop Laud, Alexander Pope, Francis Bacon, must seem different to different people. We need, in literature, in history, light and shade, we need twilight and even night; high noon all the time is intolerable. It seems unlikely that all right views on English politics, during the 17th, 18th and 19th centuries, were embodied in the Whig creed, that all the good in religion is with the Protestants and none with Roman Catholics, that a comparative estimate of national characters summed up in the phrase "as the Italian is to the Englishman, as the Hindoo is to the Italian, as the Bengal is to other Hindoos," etc., should not need explanations and qualifications. And why should a historical writer, all the time, be giving his personages good or bad marks for conduct, like a village schoolmaster?

Such faults certainly exist. Macaulay had the temperament and the manner of an orator. He took, or rather he inherited, a view, he accepted it unquestioningly with enthusiasm, even with passion, he expressed that view in as absolute and as lucid a manner as possible. He had the method of an orator whose oration will be heard but once, and who must be positive in order to convince. This may be a merit in an advocate but it is a grave fault in a writer; and one would say that with such a fault it would be impossible for a man to be a great writer. But this very fault is proof of Macaulay's extraordinary talents; with his eloquence, with his immense fund of information, with his obvious honesty and his contagious enthusiasm, he is able to cover up and conceal what in any other writer would be fatal defects.

A man without doubts, without metaphysics, without high imagination, without dreams, cannot be one of the world's greatest writers; but Macaulay was a great English writer and occupies a place in which he not only has no rival, but no competitor who can be compared with him.

CARL E. EGGERT.

MACAULAY, Trevelyan's Life of. The authoritative biography of Thomas Babington Macaulay is the 'Life and Letters' by Sir George Otto Trevelyan. It is likely always to remain the chief source of information on account of the opportunity open to the biographer of knowing the subject thoroughly and of having free access to all available material. The writer is a nephew of Lord Macaulay, the son of Hannah More Macaulay, one of the historian's favorite sisters; from his earliest boyhood he knew his uncle intimately, and was 21 years old when Macaulay died in December 1859. Lady Trevelyan bequeathed to her son the task of writing his uncle's biography, a task that occupied many years, the completed work appearing in 1876.

The excellence of the work was recognized from the first. John Morley and William Ewart Gladstone approved it at once in extensive reviews, and succeeding years have detracted not at all from their judgments. Mr. Morley commended "the skill and candor with which Mr. Trevelyan has executed a very delicate and difficult task." Excellent and abundant materials and extensive knowledge do not necessarily ensure the production of a great biography. Nor do intimacy and strong affection; close relationship, indeed, is frequently the snare that prevents success. It is a tribute to Trevelyan's genius that he was not blinded by relationship or affection, nor overcome by the excess of material with which he had to deal. The biography exhibits careful selection. If now and then the loyal nephew is unable to see anything but good in the famous uncle, he nevertheless does not represent him as faultless; he admits that Macaulay had both limitations and prejudices. Trevelyan does not intrude himself unduly upon the narrative: he keeps our attention at all times chiefly upon Macaulay. Gladstone said that one of the greatest merits of Trevelyan's work is the fact that it has movement — life. And Gladstone was right. The biography is no lifeless transcript of facts; it is a characterization and an interpretation, possessing all the qualities of the best artistic work — proper perspective, proportion, gradation. The style is attractive and contributes much to the delight of reading.

Trevelyan adopted the method employed and established by Boswell, that of allowing the subject to tell, "as far as possible," his own story. The 'Life of Macaulay' is sometimes, to be sure, mentioned along with the 'Life of Johnson,' and there is no doubt that it has taken its place as one of the greatest English biographies. It is true, however, that with all of the advantages open to Trevelyan, he yet falls short of the success attained by Boswell. The 'Macaulay' contains no such record of conversation, no such variety of "exquisite personal touches," no such dramatic quality as the 'Johnson.' Neither does it so freely portray faults and foibles. Falling somewhat short of the 'Life of Johnson' in sheer artistry, it surpasses Lockhart's 'Life of Scott' in movement and concen-

tration. Morley was giving high yet just praise when he expressed the belief that this 'Life of Macaulay' would be read throughout the world with a curiosity and an interest only to be surpassed by the success of Lord Macaulay's own writings. Consult the review of the 'Life' by John Morley (in the *Edinburgh Review,* Vol. 143); and that by Gladstone (in the *Quarterly Review,* Vol. 142). WALDO H. DUNN.

McAULEY, Catherine, Irish founder and first superior of the Sisters of Mercy: b. Stormont House, County Dublin, Ireland, 29 Sept. 1787; d. Dublin, 11 Nov. 1841. In childhood she was adopted by a wealthy Protestant family who allowed her to remain in the church of her father, the Roman Catholic, and left her a large fortune which she wished to use for the benefit of the poor. She first erected a commodious house wherein might be taught a number of poor children, and where homeless young women might find lodging and board. This institution was opened in Dublin, 24 Sept. 1827, but the religious order was not established until 12 Dec. 1831. The members of the order take the vows of poverty, chastity and obedience; and the works which they perform are visiting the poor, sick and imprisoned, teaching, establishing hospitals, orphanages, homes for the friendless and other works of mercy. There are houses of her order in nearly all parts of the world. In the United States it comprises over 4,700 members. The order includes a college for young women, at Mount Washington, Md., a large number of academies, high and elementary schools and hospitals and orphanges in nearly every State in the Union. Consult Hartnett, 'Memoir of Mother McAuley'; Murphy, 'Sketches of Irish Nunneries'; Member of Order of Mercy, 'Life of Catherine McAuley.' See MERCY, SISTERS OF.

McAULEY, m'kâ'lĭ, **"Jerry,"** New York City missionary: b. Ireland, in 1839; d. New York City, 18 Sept. 1884. He came to New York in 1852 and became a thief and prize-fighter. In 1857 he was sent to Sing Sing prison on a false charge of highway robbery, but was pardoned in 1864. He returned to his evil life. In 1872, having reformed, he opened a mission, "The Helping Hand," in Water street, a criminal neighborhood in New York. In 1882 he opened another mission, "The Jerry McAuley Cremorne Mission" and in 1883 began the publication of *Jerry McAuley's Newspaper.* He appealed with the greatest success to outcasts considered beyond redemption. After his death the work was continued by Samuel H. Hadley and John H. Wyburn. In 1912 a modern sanitary building was erected on the site of the first mission in Water street. Consult 'Jerry McAuley: his Life and Work,' autobiography edited by the Rev. Robert M. Offord (New York 1885).

MACAW, mă'kâ', name given to 15 or more species of large, long-tailed and strong-flying parrots of gaudy coloring. They belong to the genus *Ara,* and are natives of the Western Hemisphere. They live on the mainland of America from Mexico to Paraguay, being especially abundant in Bolivia, where no fewer than seven (or nearly one-half) are found. They are also in Colombia and in Cuba. In the true macaws (*Ara*) the bony orbitical ring is complete and the lores (space between the eye and the upper mandible) and, to a greater or less extent, the cheeks are naked. One of the handsomest and best known is the Blue and Yellow Macaw (*Ara ararauna*), which enjoys an extensive range in South America from Guiana in the east to Colombia in the west and from Panama to Bolivia. A little over 30 inches long it has the upper parts blue, the forehead olive-green and the ear-coverts, sides of neck, breast and abdomen yellow-orange, while the wings and long tail are blue above and golden olive-yellow below. This bird is seen in almost every zoological garden and is often kept in private houses. It possesses a fairly good temper and grows much attached to those who tend it; but, like all other macaws, it persists in violent screaming. Salmon-fishers use its feathers for the making of artificial flies. Larger and even more gorgeously plumaged is the great Red and Blue Macaw (*Ara macao*), which is mainly scarlet-red both above and below, but with the back and upper and lower tail coverts pale blue, as are the wing-quills, while the shoulders and greater coverts are chrome yellow. The tail feathers are scarlet, the two central ones scarcely tipped with blue, the blue tips increasing in extent on the outer feathers, the three outermost being almost exclusively blue. The home of the Red and Blue Macaw extends from Mexico, through Central America, to Bolivia, Guiana and the Amazon Valley. It is usually seen in pairs, or in companies of pairs. It is also a common bird in captivity. The Red and Green Macaw (*Ara chloeoptera*), ranging from Panama to Brazil, has a shorter tail than the other two and is not so frequently met with in zoological gardens. It does not extend north of Panama. It differs from the Red and Blue in being of a darker red, or crimson, and having the middle wing coverts olive-green instead of yellow. The Green Macaw (*Ara milateris*) is green throughout, except for the presence of a scarlet patch on the forehead and blue on back, rump, wings and tail. It is 27 inches long and ranges from Mexico to Peru and Bolivia,—the most northern of all in distribution. It is well known in captivity. Colonel Grayson and other writers explain that this macaw is called "guacamayo" by the natives of Mexico and Central America, because they believe that it descends to the ground only once a year, and this in the month of May, when it searches the ground for a very hard-shelled palm-nut of which it is fond. This rather surprising statement is probably substantially true, as there seems no other reason why it should ever alight on the ground, where it would be exposed to much more danger than in the tree-tops, where it finds abundant food the year round. The tree of this nut the Mexicans call Ava, a species of *Nux vomica.* Both the milky sap of the tree, as well as the fruit, are deadly poison to any other creature but this parrot. The shell is exceedingly hard, but the enormous bill and powerful jaws of the Guacamayo enables it to split the nut with ease. When migrating to some distance these birds pass at a great height, flying in pairs and uttering harsh and discordant cries.

The Hyacinthine Macaw (*Ara hyacinthus*) of the central provinces of Brazil is a splendid bird. It is about three feet long, the plumage being nearly uniform cobalt blue, relieved by

bright yellow skin about the eyes and at the base of the lower mandible and a black bill which is of enormous size. This appears to be a rare species, occurring, according to Riker, about the inland ponds in the dense forests of the interior, where it feeds chiefly upon the fruit of a palm peculiar to these localities. Some of these palm fruits are of extraordinary hardness, but these birds crush them to pulp by their bills. The nesting habits of the Hyacinthine differ from those of other macaws in that they excavate a hole in the river bank for their nest instead of placing it in a hollow tree. In Spixi Macaw (*Cynopsittacus Spixi*), of the province of Bahia, Brazil, the lores are naked and the general color also blue; but parts of the head are more or less grayish.

All macaws live well in captivity and are often kept chained to a perch. Few persons are acquainted with their strong, wonderful and graceful flight. They all scream harshly. They are gregarious and apparently monogamous, and lay two lustreless white eggs in nests in hollow trees. One of their characteristics is a long and graduated tail with the individual feathers tapering to a point and the middle pair always the longest. The bill is powerful and usually deeper than long. Consult Greene, William Thomas, 'Parrots in Captivity,' with notes (3 vols., London 1884–87); id., 'Parrots in Captivity,' colored illustration (London 1884); Lear, Edward, 'Illustrations of the Family of Psittacidae, or Parrots' (folio, London 1832); Page, Charles N., 'Parrots and Other Talking Birds: their Foods, Care and Training' (Des Moines 1906).

MACAW TREE (*Acrocomia sclerocarpa*), a palm of the same family as the cocoanut. It is a native of the West Indies and of the warm parts of America. It grows from 20 to 30 feet high with pinnated leaves from 10 to 15 feet long. The fruit yields oil of a yellowish hue, sweetish taste and with an odor like violets. This oil is about the consistency of butter. In the native regions of the tree the inhabitants use this oil as an emollient for affections of the joints. It is extensively imported and is used in the manufacture of toilet soaps as palm oil. The leaves yield a fine, soft fibre. In Guiana the tree is called *Macoya*, in Brazil it is called *Macahuba*, in Jamaica *Grugru*. In southern California this palm is cultivated as an ornamental tree.

MACAYO, mä-sī-ō, Brazil. See MACEIO.

MACBETH, or MACBETHAD, Mac-Finlegh, king of Scotland, who reigned from 1040 to 1057. The facts of his life, so far as known, are these. During the reign of Duncan he was "mormaer" of Moray by inheritance, and by his marriage with Gruoch, granddaughter of Kenneth IV. Duncan, in his attempt to subdue the independent chiefs of the north, was defeated in a battle with the Earl of Orkney and Shetland at Burghead, near Elgin in 1040; but was murdered at Pitgaveny, nine miles from the battlefield, by Macbeth, his general. By this means Macbeth became king, and, according to accounts, his reign was fairly successful. He was finally defeated in battle and slain by Malcolm Ceannmor, son of the murdered Duncan, at Lumphanan, Aberdeen (1057). The legends which gradually gathered round the name of Macbeth were collected by John of Fordun and Hector Boece, reproduced by Holinshed in his 'Chronicle' (1577) and made use of by Shakespeare for his great tragedy. These writers appear to have overlooked the excellent qualities of Macbeth as king, and regarded him with horror as a usurper. Consult Robertson, 'Scotland under her Early Kings' (1862); Skene, 'Celtic Scotland' (1876–80), and Rhys, E., 'Celtic Britain' (3d ed., London 1904).

MACBETH. This play was not published until 1623, though it was probably written several years before Shakespeare's death. A reference to it in 1610 by Dr. Simon Forman, the probable reference to the accession of James the First (1603) that brought about the union of two crowns, and the proportion of rhyme, blank verse and prose, point to 1605–06 as the probable date. Because of its late publication the text is one of the most corrupt of Shakespeare's plays. It may have been taken down from the play as acted, or it may be a transcript of the author's manuscript which was in great part not copied from the original but written to dictation. Act 1, scene 2, and part of scene 3 may be an interpolation, but the Porter Scene, which was long considered to be the work of a collaborator, is now justified by reason of its dramatic contrast with the preceding scene and by the amazing felicity of such lines as, "go the primrose way to the everlasting bonfire." With the exception of a few lines and scenes Macbeth is an example of amazing concentration — it has neither underplot, nor, with the exception of the Porter Scene, such comic scenes as are found in nearly all of the other tragedies of Shakespeare. It is shorter by some thousand lines than any other tragedy and moves along with the swiftness of a tempest. The 20 years of history become nine days of dramatic time, and so swift is the passage of time that it seems but a few hours.

Shakespeare was indebted for the main events of the play to Holinshed's 'Chronicles of Scotland.' The character and the story of Macbeth, partly historical and partly legendary, were drawn largely from this source, but the witches were the creation of Shakespeare's genius from the shadowy creatures of a crude folklore. There is just enough of the popular conception of supernatural creatures of evil to satisfy the demands of the age in which he lived, but he informed this popular and somewhat vulgar superstition with a moral significance suited to all ages alike. These invisible, unearthly creatures do not create the evil in Macbeth's mind; they only serve to bring into lifelike reality the evil that is already there. They are an embodiment of the same forces as the thunder, lightning, rain — nature "red in tooth and claw" — that constitute the background for the evil forces that are at play in this drama. While the minor characters of the play, and especially Banquo, are adequately presented, the interest centres in Macbeth and Lady Macbeth, who while engaged in the same evil deeds yet reveal differences of temperament and character that afford the most significant dramatic contrasts. Lady Macbeth before the murder of Duncan displays firm, sharp, wiry, matter-of-fact intellect and energy of will; she becomes for the time being possessed by one thought, one ambition. She has no imagination to represent

for her the inevitable consequences of the murder. As soon, however, as the deed is done, her womanly nature asserts itself; her amazing self-control gives way, and remorse wells up in her conscience-tortured heart. She had denied the quality of her sex, only to find that the woman was stronger than the queen or the wife. Macbeth, on the other hand, is possessed from the beginning by a vivid imagination that visualizes the deed itself and falters at its contemplation. Deeper and deeper he plunges into guilt until a sort of world-weariness and sick despair settle upon his brooding spirit. In words as eloquent as Shakespeare ever wrote he pronounces a requiem upon his wife and summarizes his pessimistic indictment of old age and of life; life is to him but "a tale told by an idiot, full of sound and fury, signifying nothing." He dies with the harness on his back, the intrepid soldier that he has always been, but with a sigh that pierces to the depths.

EDWIN MIMS.

McBRIDE, măk-brīd, **SIR Richard,** Canadian statesman: b. New Westminster, British Columbia, 15 Dec. 1870, where his father held office under the Crown. He was educated at Dalhousie University, Halifax, Nova Scotia, graduating in 1890, called to the bar in 1892, he practised his profession in Victoria. Entering politics he was elected in 1898 a Conservative of the provincial legislature. In 1900–01 he was Minister of Mines in the Provincial Ministry; in 1902–03 a leader of the Conservative opposition; in 1903 Premier and Minister of Mines; in 1906 a delegate to the Interprovincial Conference at Ottawa; and in 1907 a delegate to the Colonial Conference at London (England). In 1912 he was knighted. Consult Gregg, T. A., 'Richard McBride,' with portrait, *Canadian Magazine* (July 1904).

MACBRIDE, Thomas Huston, American educator and botanist: b. Rogersville, Tenn., 31 July 1848. After graduation at Monmouth College in 1869 he taught mathematics and modern languages at Lenox College from 1870 till 1878, in which year he became assistant professor of natural sciences. In 1884 he was made professor of botany and held this post until 1914 when he became president. Since 1916 he has been president emeritus. His specialty is fungi. Dr. Macbride has had many degrees: Monmouth gave him A.M. in 1873; the University of Bonn the same in 1891; Lenox gave him Ph.D. in 1895; Monmouth that of LL.D. in 1914, and Coe the same in 1915. He is a member of many scientific societies, of the American Forestry Association, Iowa Park and Forestry Association and of the Society of Botanists of the Central States. He is also a Fellow of the Botanical Society of America. He has published many of his lectures and addresses, has contributed to the *Popular Science Monthly, Science,* etc., and is the author of a textbook on 'Botany' (1895) and 'North American Slime Moulds' (1899).

McBURNEY, măk-bėr'ni, **Charles,** American surgeon: b. Roxbury, Mass., 17 Feb. 1845; d. 1913. He was graduated at Harvard in 1866; and from the Columbia Medical School in 1870, and thereafter practised his profession in New York. He was professor of surgery in the College of Physicians and Surgeons, New York, and was visiting and consulting surgeon at Saint Luke's, the Presbyterian, Roosevelt, New York Orthopedic and other hospitals. He became widely known as a very skilful operative surgeon, and was Fellow or member of many medical societies of this country and Europe. He discovered "McBurney's point," which is pathognomonic of appendicitis. He was a world-wide authority on appendicitis. When President McKinley was shot, Dr. McBurney was summoned to Buffalo as consulting surgeon. He was a great teacher as well as a great surgeon.

McBURNEY, Robert Raikes, American religious worker: b. Castleblaney, Ireland, 31 March 1837; d. Clifton Springs, N. Y., *27* Dec. 1898. He came to the United States in 1854, and from 1862 was the general secretary of the New York Young Men's Christian Association. He was devoted to his work, and with the progress of years came to be recognized as the leading Y. M. C. A. secretary in the world.

McCABE, ma-kāb', **Charles Cardwell,** American Methodist bishop: b. Athens, Ohio, 11 Oct. 1836; d. New York, 19 Dec. 1906. He was educated at Ohio Wesleyan University. In 1860 he entered the Methodist Episcopal ministry, and in 1862 was appointed chaplain of the 122d Ohio Infantry. At the battle of Winchester he was captured, and held in Libby prison for four months, and soon after his release entered the service of the United States Christian Commission and succeeded in raising a large amount of money for its work. Later he became financial agent for Wesleyan University; and in 1884 was made secretary of the Methodist Episcopal Missionary Society. He was remarkably successful in raising large amounts of money for missionary purposes. He became a bishop of his Church in 1896, and in December 1902 was elected chancellor of the American University at Washington, D. C.

McCABE, James Dabney, American author: b. Richmond, Va., 30 July 1842; d. Germantown, Pa., *27* Jan. 1883. He was the son of James Dabney McCabe (1808–75), a Protestant Episcopal clergyman and writer, and was educated at the Virginia Military Institute. He began to write very early. At the beginning of the Civil War he published a pamphlet entitled 'Fanaticism and its Results, by A. Southerner' (Richmond 1860) and throughout the war he employed his pen effectively in the cause of the Confederates. Three martial plays were performed in Richmond in 1862–63 and his war-story, 'The Aide-de-Camp,' was issued in 1863. In 1863 he published a Christmas compilation called 'The Bohemian' and in 1863–64 edited *The Magnolia Weekly.* His war-poems were very popular, particularly 'The Sword of Harry Lee.' He wrote several biographies, including 'Life of Gen. Thomas J. Jackson' (Richmond 1863); 'Memoir of Gen. Albert S. Johnston' (1866); and 'Life and Campaigns of Gen. Robert E. Lee' (New York 1867). His other works are 'Planting the Wilderness' (Boston 1869); 'History of the Late War between Germany and France' (1871); 'Lights and Shadows of New York Life' (New York 1872); 'History of the Grange Monument,' published under the name of Edward Winslow Martin (Chicago 1874); 'Paris by Sunlight and Gaslight' (Philadelphia 1875); 'Centennial History of the United

States' (Philadelphia 1875); 'Pathways of the Holy Land' (1877); 'History of the Turko-Russian War' (1879); 'Our Young Folks Abroad' (Philadelphia 1881), and 'Our Young Folks in Africa' (1882). Besides these he was the author of several hundreds of short stories, essays and translations, and made a compilation of the romance and humor of the war called 'The Grayjackets' (1867).

McCABE, Joseph, British rationalist: b. England, 1867. He was educated at Saint Francis's, Manchester, at Saint Anthony's, Forest Gate and at the University of Louvain. In 1883 he became a Franciscan was ordained a priest in 1890 and in 1895 became rector of Buckingham College. In 1896 he left the Roman Catholic Church and became a lecturer and writer on rationalistic subjects. His books include 'Twelve Years in a Monastery' (London 1897); 'Modern Rationalism' (1897); 'Abelard' (1901); 'Saint Augustine and his Age' (1902); 'Talleyrand' (1906); 'The Martyrdom of Ferrer' (1909); 'The Decay of the Church of Rome' (1909); 'The Evolution of Mind' (1910); 'The Empresses of Rome' (1911); 'The Story of Evolution' (1912); 'Goethe' (1912); 'The Empresses of Constantinople' (1913); 'A Candid History of the Jesuits' (1913); 'The Sources of the Morality of the Gospels' (1914): George 'Bernard Shaw' (1914); 'The Soul of Europe' (1915); 'The Kaiser' (1915); 'Crises in the History of the Papacy' (1916); 'The Romance of the Romanoffs' (1917); 'The Bankruptcy of Religion' (1917); 'The Pope and the Church' (1918). He has also published translations of Haeckel, Ferrer and Günther. Under the heading "Mr. McCabe and a Divine Frivolity" Chesterton devotes a chapter to him in 'Heretics' (London 1909).

MACCABEES, a famous family which battled for liberty in the 2d century B.C., when the Jews were persecuted by the Syrians under Antiochus IV, Epiphanes. Originally applied to Judas, the third son of the aged priest Mattathias, who began the revolt, the name was widened to include the family of Judas and his followers, in due course to be applied to all wrestlers for freedom in the Greek period of Jewish history. The word's origin has received various fanciful explanations, but the most probable etymology is from the Aramaic *maqquaba* (Judges iv, 21 and elsewhere) meaning "Hammer."

The story of the Maccabean struggle belongs to the history of heroism in all ages. When Antiochus of Syria (175–164 B.C.) strove to impose Hellenism in its crassest form upon the Jews under his sway and Jerusalem was overrun, while pagan rites were ordered to be substituted for Jewish, a sacrifice to Zeus being offered (168) on the Temple altar, an aged priest at Modin, Mattathias, spurned the mandate, killed the royal messenger, and destroyed the altar. Then escaping with his five sons to the mountains, he raised the standard of revolt. Two years later he died, and Judas, the third son, was acclaimed leader. His skill and genius, joined to a religious fervor that was the secret of his strength, cleared away every obstacle, as he defeated in rapid succession the three Syrian generals, Apollonius, Seron and Gorgias, and later the regent, Lysias. In 165 he reconsecrated the Temple amid the exultation of the people — the festival of Hannukkah, in memory of this restoration is still observed by the Jews of every land. In 162 Lysias granted religious freedom but Judas resolved to fight on until political liberty was also attained. A year later he defeated Nicanor at Adasa, but shortly afterward he fell at Elasa, while resisting Bacchides with greatly superior forces.

The command was now assumed by his brother Jonathan, who was astute enough to secure the favor of the Syrian ruler and was made high priest (153). For a time he fought for Antiochus VI, who owed his crown to Tryphon, and succeeded so well as to awaken Tryphon's jealousy. He fell into his power at Ptolemais and was finally put to death (143). Simon, the last surviving son of Mattathias, became leader of the Jewish people. By his ability and force of character, he outwitted Tryphon and secured the independence of Judæa. In 141 he was appointed by the people hereditary leader and high priest. With him began properly the Hasmonean dynasty — the name being traced to an ancestor of the house Asamonaios (Josephus, Antiq. xii, 6); according to Wellhausen (*Phar. und Sadd.* x, Note 94) he was the grandfather of Mattathias. The first year of his reign marked the beginning of a new era (Seleucid year 170 = 143–142 B.C.). The country enjoyed much prosperity, its resources were greatly developed and the outlook was distinctly more favorable than at any previous period since the Exile. With a change of rulers in Syria, Antiochus (VII) Sidetes becoming king, Simon and two of his sons were murdered by his son-in-law who wished to curry favor with the new monarch. But the third son, John Hyrcan, escaped and succeeded to the throne, reigning 30 years with much ability. Partisan strife, however, disturbed the kingdom's peace and weakened its strength, with the constant clashing of Pharisee and Sadducee.

On the death of John Hyrcan (105), his son Aristobulus reigned for a year when his brother Alexander Jannæus became ruler (104–78), a man of considerable energy, in his persistent conflicts to extend and defend his realm. His sympathies were with the Sadducees, and once when officiating as high priest, some of the Pharisees in their anger threw at him and the attending Sadducees citrons which had been supplied for the Feast of Tabernacles. As punishment, he attacked them with his troops, killing 6,000. On his death his widow, Salome Alexandra, ruled (78–69), reversing his policy and making the Pharisees her favorites, the land enjoying peace and prosperous growth. Her eldest son, Hyrcan II, who lacked capacity, was made high priest. The younger, Aristobulus, stronger and abler, coveted the succession and organized an army to conquer Jerusalem, when Alexandra died and Hyrcan was willing to retire in his brother's favor.

At this moment a new factor appeared in the person of Antipater of Idumæa who sought to further his own designs. An appeal to Rome was made. Pompey resolved to settle the matter in his own fashion, at some slight which Aristobulus offered, entered Jerusalem and made Hyrcan II high priest and ethnarch, while his brother was carried a captive to Rome. And now the Roman yoke became firmly fastened, Antipater was made procurator in 47, with his

sons Phasæl and Herod governors of Jerusalem and Galilee. In 41 they became tetrarchs of Judæa. In 40, Antigonus, the sole surviving son of Aristobulus, was appointed king by the Parthians, in the swift changes of the day. But Herod who had escaped from prison, while his brother had committed suicide, was given the throne by the Romans (37 B.C.). In the same year Antigonus was put to death by Mark Antony and the Maccabean-Hasmonean dynasty ended.

Bibliography.— Curtiss, 'The Name Maccabee' (Leipzig 1876); Henderson, F., 'The Age of the Maccabees' (1898); Morrison, 'The Jews under Roman Rule'; Streanes, 'The Age of the Maccabees'; Weiss, 'Judas Makkabeaus' (1897). Consult modern histories of the Jews, Graetz, Schürer, etc.

ABRAM S. ISAACS.

MACCABEES, Book of the, a name given to several Apocryphal books of the Old Testament. Of the four or five thus termed, two were declared canonical by the Council of Trent (1546), are contained in the Vulgate, and among the Apocrypha of the English Bible. The three other books may be summarized: Book III is found in the Septuagint but not in the Vulgate, Book IV is included in some manuscripts of the Septuagint and of Josephus. Book V is merely a Syriac reproduction of the sixth book of Josephus' 'Jewish War' and is of no historical value.

First Book was the record of 40 years from the accession of Antiochus (175 B.C.) to the death of Simon (135 B.C.), and is composed after the model of the Old Testament historical style, terse, simple, and at times poetic and impassioned. The narrative is written with due proportion and in sympathetic tone. All events are dated in terms of the Seleucid era. It is generally admitted that the original was in a Semitic language, most probably Hebrew, to which both Origen and Jerome bear testimony. However, it is not impossible that they were acquainted with an Aramaic version or paraphrase. The Greek translation of the Hebrew was made at an early date and has alone survived. It bears all the marks of a literal translation, preserving the Semitic and at times the Hebrew idiom. The author, to judge from the book itself, was a pious and patriotic Jew: a Palestinian, to infer from his evident familiarity with the Holy Land and his want of knowledge as to the foreign lands mentioned. An admirer of the Maccabees and their military skill, he shows the influences of his day by omitting the words «God» and «Lord» as in the book of Esther, substituting «He» and «Heaven.» Owing to his omission of the disloyal priests, Jason and Menalaus, in striking contrast to the attitude of the Second Book, Geiger claims a Sadducee as its author, a view held by later authorities, even if Geiger's views as to its being a partisan document are not upheld. Opinions differ as to its precise date — Schürer tracing it to the first or second decade of the 1st century B.C., while Torrey dates it early, in the reign of Simon, a little after 135 B.C. The book is one of the most vivid and valuable sources extant for Jewish history.

Second Book, has a peculiar opening — two letters written by Jews of Palestine to brethren in Egypt, held by some to be spurious. The work itself, an abridgment of five books written by Jason of Cyrene, covers Jewish history from a period a year earlier (176 B.C.) than its predecessor to the death of Nicanor (161 B.C.). It is of special interest as picturing the situations in Palestine before the revolt of Mattathias and furnishing other data that are lacking in the First Book. The author, probably a Hellenistic Jew, writes largely from the religious point of view, is a Pharisee, with a direct partisan tendency. Greek was the original language. Its exact or approximate date cannot be fixed. Among its characteristics are allusions to angels and spirits, to resurrection and immortality — that the book concludes with the victory of Judas over Nicanor, indicates its aim — to arouse the Jew to observe the two Maccabean feasts, that of Dedication and of Nicanor. The incident of the mother and her seven sons, and other stories of martyrdom have given the book a value and power of its own, which appealed with special force to the Christians of the first four centuries, as Bevan states in his 'House of Seleucus' (1902, II 175).

Third Book describes the escape of the Jews from martyrdom in Alexandria in the reign of Ptolemy IV, Philopator (222–204 B.C.). It has no relation to the Maccabees, but doubtless its title was given later when all who suffered for the olden faith were called by that name. It was written by an Alexandrian Jew to give courage and endurance to his brethren in Egypt. In view of the fact that early Jewish settlements in the Fajum have been discovered. Both I. Abrahams and A. Büchler claim the book has distinct reference to a persecution in the Fajum — a theory that is disputed.

Fourth Book has been aptly described by Freudenthal (Breslau 1869) as a homily delivered probably on the Feast of Dedication to a Greek-speaking Jewish community. It is sermon not history, to prove how the passions can be controlled by the reason, by which term he means reason enlightened by religion and the Mosaic Law. This thesis is illustrated by many examples, notably from the Maccabean struggle. A Hellenist to a certain extent, he was nevertheless an earnest, loyal Jew, eloquent and convincing. His precise date is unknown. He supplied the model for similar homilies by Christian writers in the early centuries, with their thrilling martyrdoms. In the Church the book was attributed to Josephus and added to his writings, with whose style and language it is wholly incompatible.

Without historical value is the so-called *Fifth Book* which Cotton gives in his 'Five Books of the Maccabees' (1832), and known also as the Arabic 'Book of Maccabees' which claims to be the history of the Jews from 186 B.C. to the end of Herod's reign, but which in reality is nothing but a compilation from First and Second Books of Maccabees and Josephus. The manuscript of a 'Fifth Book' which Sixtus Senensis (1566) states that he saw in Lyons and which was subsequently lost by fire, is characterized by Schürer as a «reproduction of Josephus, the style being changed for a purpose.»

Bibliography.— Abrahams, I., 'J. Q. R.' (1896–97, IX, 39); Büchler, A., 'Tobiaden and

Oniaden' (Vienna 1899); Fairweather and Black, 'First Book of Macc. in Cambridge Bible Texts'; Grimm in 'Handbuch zu den Apokryphen'; Kacutzsch, 'Apokryphen'; Schürer, 'History of the Jewish People.'

ABRAM S. ISAACS.

MACCABEES, Knights of the Modern. See MACCABEES, THE.

MACCABEES, The Ladies of the, a fraternal beneficiary association, founded in 1886, formerly the Ladies of the Modern Maccabees. Until 1914 it formed a species of auxiliary organization to the Knights of the Maccabees and the latter exercised over it a kind of guardianship. It has about 50,000 members and since its institution has distributed about $7,000,000 in benefits and insurance.

MACCABEES, Ladies of the Modern. See LADIES OF THE MACCABEES.

MACCABEES, The, a secret fraternal beneficiary association having its general offices at Port Huron, Mich. An association bearing the name of Knights of the Maccabees of the World was first organized in the city of London, Canada, in the year 1878, by W. D. McLaughlan and several other gentlemen of that city. The Association grew rapidly, and its tents, as its local lodges were called, sprung up all over the Canadian provinces and in many of the States of the American Union. In 1914 it united with the Knights of the Modern Maccabees, long a rival organization under the general title of the Maccabees.

The Association takes its name from the Maccabees, a chivalrous and religious people whose history is given in the apochryphal writings of the Old Testament. The leading character in this history was Judas Maccabeus, a valiant soldier and one of the foremost generals of the period in which he lived. During the wars in which the Maccabees were engaged and in which he was their leader he required that a portion of the fruits of all their victories should be set aside for the benefit of the widows and orphans of those who had fallen in battle.

It was this particular practice and characteristic that probably suggested to Mr. McLaughlan and his co-laborers the name for their new society, because the purpose of this society, as set forth in their laws, was to unite fraternally all white male persons of sound bodily health and good moral character, between the ages of 18 and 70 years of age, and to provide for such members benefits in case of disability, and to the beneficiaries of such members benefits in case of their death.

The main purpose of this Association is to provide social and fraternal intercourse for its members, and benefits in the way of insurance to the families of deceased members. The constituent organizations have distributed about $80,000,000 among the disabled members and the beneficiaries of the deceased members. The assets of the new united organization amount to $20,000,000. There are more than 300,000 members.

Its work is conducted on the lodge system under ritualistic ceremony. Its form of government is thoroughly representative, every member having a voice in the conduct of its affairs, making of its laws, the election of its officers and the fixing of their compensation. The general meeting of the law-making body (The Supreme Tent) is held once in three years, at which the members are represented through delegates chosen from subordinate tents, conventions and great camps. In the interim between the meetings of its governing body its affairs are administered by a board of seven trustees, consisting of the supreme commander and six others elected by the Supreme Tent. The board of trustees has the general custody and management of the funds of the Association; under its direction all investments are made, the laws of the Association requiring that all investments shall be made in government, State and municipal bonds.

MACCABEES, The Woman's Benefit Association of the, an adequate rate fraternal order for women with headquarters at Port Huron, Mich. Miss Bina M. West is the founder and present supreme commander and Miss Frances D. Partridge the supreme record keeper. Organized in 1892, as the Ladies of the Maccabees of the World, reorganized under its present name in 1915 and established in the United States and Canada, the order has 3,000 local bodies with 192,000 members and a reserve fund of $12,000,000; it has paid in death benefits about $15,500,000; provides whole life, term and disability protection; 20-year plans; junior protection for children of members; sick, last illness and burial; and maternity benefits. It maintains a free hospital service in every State for needy sick, and a patriotic service for the aid of members affected by the war. It is the first society of its kind to own a home-office building, erected at a cost of $250,000 without extra cost to its members through the advance in values of property holdings. The order is founded, officered and managed solely by women for home protection, mutual fellowship and fraternal aid.

McCALL, Edward Everett, American jurist: b. Albany, N. Y., 6 Jan. 1863. He was educated at the Albany High School and the New York University, was admitted to the bar in 1884 and practised in New York from 1884 till 1902. From that year until 1913 he was justice of the Supreme Court of New York (1st district) and Democratic candidate for mayor of New York in 1913, but was defeated by the late John Purroy Mitchel (q.v.). Judge McCall is a member of various New York clubs, including the Lotus, Manhattan, Catholic, Democratic and Athletic.

McCALL, mą-kâl', George Archibald, American soldier: b. Philadelphia, 16 March 1802; d. 25 Feb. 1868. He was graduated at West Point in 1822; in 1836 reached the rank of captain, and that of colonel in 1850. Having served against the Seminoles in Florida, he won distinction in the Mexican War; in 1850 he became inspector-general, resigning from the army three years later. In 1861 he was given command of the Pennsylvania Reserves, with the rank of brigadier-general of volunteers, and participated in the work of the Army of the Potomac, particularly in the Peninsular campaign of 1862, in which he was engaged with his troops at Mechanicsville, Gaines' Mill and Frazier's Farm (qq.v.). At Frazier's Farm, 30 June, he was taken prisoner and was confined for several weeks in Libby prison. In August he was exchanged, but impaired health pre-

vented him from returning to the army, and in 1863 he resigned. He wrote 'Letters From the Frontier' (1868).

McCALL, John Augustin, American insurance official: b. Albany, N. Y., 2 March 1849; d. Lakewood, N. J., 18 Feb. 1906. He was educated in his native city and served for several years as clerk in the Connecticut Mutual Life Insurance Company. In 1877 he entered the New York State insurance department in which he served as clerk, deputy superintendent and superintendent. In 1887 he was made comptroller of the Equitable Life Assurance Company and in 1892 became president of the New York Life Insurance Company. In 1905 the Armstrong insurance investigation led to his resignation in 1906 and he died two months after resigning.

McCALL, Samuel Walker, American public official: b. East Providence, Pa., 28 Feb. 1851. In 1874 he was graduated at Dartmouth College, studied law and was admitted to the bar in 1876, since when he has practised in Boston. He was editor-in-chief of the Boston *Daily Advertiser* in 1888–89 and served as delegate at the Republican National Convention of 1888, 1900 and 1916. He was member of the Massachusetts house of representatives in 1888, 1889 and 1892 and was a member of Congress from 1893 to 1913 from the Eighth Massachusetts district. He was an unsuccessful candidate for the governorship of Massachusetts in 1914. He was successful the following year, being elected governor for 1916. He was re-elected for the two successive terms of 1917 and 1918. He has published 'Life of Thaddeus Stevens' (1899); 'Dartmouth Centennial Address on Daniel Webster' (1902); 'The Business of Congress' (1911); 'Life of Thomas B. Reed' (1914); 'The Liberty of Citizenship' (1915), and magazine articles. He received honorary degrees from Dartmouth, Oberlin, Tufts, Maine, Trinity, Columbia and Williams.

McCALLA, Bowman Hendry, American naval officer: b. Camden, N. J., 19 June 1844; d. Santa Barbara, Cal., 6 May 1910. He was graduated at the United States Naval Academy in 1864 and rose to captain in 1898. In 1890 he was court-martialed on charge of cruelty to his subordinates and was suspended for three years, but in consideration of previous acts of gallantry was restored to active service in 1891. He commanded the *Marblehead* during the war with Spain in 1898 and was subsequently restored to the place he held on the list of officers previous to his suspension. In 1899 he commanded the *Newark* and aided in the pacification of the Philippines. In 1900 he cooperated with Vice-Admiral Seymour in putting a stop to the Boxer troubles at Peking. In 1901 he was given command of the *Kearsarge;* in 1905 became commandant of the Mare Island navy yard and was retired 19 June 1906.

MacCAMERON, mă-kăm'ĕr-ŏn, **Robert Lee,** American painter: b. Chicago, 1866; d. New York, 29 Dec. 1912. After studying in the public schools he began to make sketches for the newspapers in Chicago, and soon removed to New York, where he illustrated for newspapers and studied under William M. Chase. He then went to Paris and studied at the Beaux Arts under Gérôme and Collin. He became a successful portrait painter and for several years before his death kept studios in London, Paris and New York. For his 'Mi-Carême' he received honorable mention in the Paris Salon, and in 1912 he was made a chevalier of the Legion of Honor. He was a member of several foreign and American art societies. Among his best portraits are President Taft, President McKinley, Archbishop Ryan, Justices of the Supreme Court, Harlan and Brewer, Nellie Melba and Auguste Rodin (Metropolitan Museum, New York). MacCameron also achieved reputation for his *cafés* and scenes in theatres. 'A Group of Friends,' also called 'Wormwood,' painted in 1908, is in the Corcoran Gallery, Washington; 'The Daughter's Return,' painted in 1909, is in the Metropolitan Museum, New York. 'Les Habitués (The Old Customers) hangs in the Wilstach Gallery, Philadelphia. He also painted a religious picture, 'The Last Supper,' in 1909. His last work was 'The People of the Abyss' (1912). Consult *Harper's Weekly* (February 1913).

McCAMMON, Joseph Kay, American lawyer: b. Philadelphia, 13 Oct. 1845; d. 2 Jan. 1907. He graduated at Princeton in 1865; studied law; became register in bankruptcy in 1870; was special counsel of the United States in Washington 1871; president of the board for investigation of the Indian service, 1877; Assistant Attorney-General of the United States, 1880–85, and in 1881 was appointed United States commissioner of railroads. Under Presidents Garfield and Arthur he conducted treaties with various Indian tribes. Among his writings are a 'Report on Indian Service' (1878); 'Report of Councils with Bannock and Shoshone Indians' (1881); 'Report of Councils with Flathead and Other Indians' (1882); 'Arguments in Cases Affecting Pacific and Other Railroads.'

McCARREN, mă'kăr'ĕn, **Patrick Henry,** American politician: b. East Cambridge, Mass., in 1849; d. Brooklyn, 22 Oct. 1909. In 1851 he removed to Williamsburg (Brooklyn, N. Y.) and was apprenticed to a cooper, but soon left trade and entered local politics. Before he was 21 he had been defeated for the leadership of his district. In 1881 he was elected to the New York assembly and was re-elected in 1883 and 1887. In 1889 he was elected to the State senate and was continuously a member of that body until his death. In 1893 he became virtually the leader of the Brooklyn Democracy. He broke with Charles F. Murphy, the leader of Tammany Hall, and from that time a bitter fight was kept up between these two politicians for the control of the Brooklyn Democracy. In 1904 one of the bitterest chapters in the history of New York politics occurred. McCarren also opposed W. J. Bryan and Charles E. Hughes. McCarren was a man of keen intellect and an aggressive fighter. He was identified with the Standard Oil Company and the American Sugar Company.

McCARTER, Margaret Hill, authoress: b. Charlottesville, Ind., 2 May 1860. She began teaching in elementary schools in Indiana in 1876; graduated A.B. at the State Normal School, Terre Haute, Ind., in 1884; was principal of the High School, Rensselaer, Ind., 1884–87; held other educational positions to 1894, and was a lecturer of the State Board of

Education. She married, 5 June 1890, William Arthur McCarter, D.D.S., of Topeka, Kan. She became widely known by her fiction which is as popular in her State as that of William Allen White of Emporia. Her publications include 'The Overflowing Waters' (1903); 'The Cottonwood's Story' (1903); 'Cuddy's Baby' (1907); 'The Old Quirra' (1908); 'Cuddy and Other Stories' (1908); 'The Price of the Prairies' (1910); 'The Peace of the Solomon Valley' (1911); 'A Wall of Men' (1912); 'Master's Degree' (1913); 'Winning of the Wilderness' (1914); 'The Corner Stone' (1915); 'Vanguards of the Plains' (1917).

McCARTHY, D'Alton, Canadian politician: b. near Dublin, Ireland, in 1836; d. Canada, 11 May 1898. He was the son of an Irish barrister who found a home for his family on the shores of Kempfendfeldt Bay, Ontario, after a six weeks' voyage in a sailing vessel. Educated at the Barrie Grammar School, he studied law and was called to the bar in 1858. In 1872 he was made queen's counsel, and attained high rank both in jury cases and appeal cases. In 1876 he was elected to the House of Commons as a Conservative and held this seat until his death, which was occasioned by a railway accident. He seceded from the Conservative party and aided the Liberals in opposing special legislation in the interest of Roman Catholic education. He was for a time president of the Canadian branch of the Imperial Federation League and a member of the Council of the British Empire League. Consult 'The Late D'Alton McCarthy, Q.C., M.P., an Appreciation,' by Amicus, *Canadian Magazine* (May 1903).

MacCARTHY, Hamilton Thomas, Canadian sculptor: b. London, England, 1847. He studied under his father and in Europe, and in 1885 removed to Canada. He lived in Toronto until 1898, when he took up his residence in Ottawa. He is distinguished for his capacity for expressing contemporary thought. The Royal Canadian Academy elected him a member in 1890 and councillor in 1906. Among his works are 'Burns and Highland Mary' (1877); the statue of Sir John S. Macdonald in Toronto; the bronze monuments for the South African War in Halifax, Ottawa, Charlottetown, Quebec and Brantford.

McCARTHY, mą-kar'thi, **Justin,** Irish author and politician: b. Cork, Ireland, 22 Nov. 1830; d. 24 April 1912. He became connected with the Liverpool press in 1853 and in 1864 was made editor-in-chief of the Morning *Star*. He sat in Parliament as a Home Ruler from 1879–1900 and was chairman of the Irish Parliamentary party 1890–96. His stay in the United States extended from 1868 to 1870, during which period he was some time connected editorially with the New York *Independent*. His main work is 'History of our Own Times' (1879–80), which, rejected by one publishing house, made a fortune for the firm that produced it as well as for the author. He also wrote 'History of the Four Georges' (1889), and his novels include 'Lady Judith' (1871); 'A Fair Saxon' (1873); 'Dear Lady Disdain' (1875); 'The Right Honorable' (1886, with Mrs. Campbell-Praed); 'The Story of Gladstone's Life' (1898); 'Modern England' (1898); 'Reminiscences' (1899); 'The Reign of Queen Anne' (1902), and 'The Story of an Irishman' (1904).

McCARTHY, Justin Huntly, Irish journalist and author: b. 1860. He was graduated at University College and from 1884–92 was a member of Parliament. He has been a prolific and versatile author, following in the footsteps of his father, Justin McCarthy (q.v.). Among his works are 'Outline of Irish History' (1883); 'Serapion, and Other Poems' (1883); 'England Under Gladstone' (1884); 'Camiola, a Girl with a Fortune' (1885); 'History of the French Revolution' (1897); 'Short History of the United States'; 'The Dryad' (1905). He has also written plays, such as 'The Candidate'; 'The White Carnation'; 'If I Were King,' and 'The Proud Prince.'

McCAUL, mą-kâl', **John,** Canadian scholar: b. Dublin, Ireland, 1807; d. 1880. He was appointed president of Toronto University in 1848 and was prominent for many years in educational matters in Canada. He edited Horace, Longinus, Lucian and Thucydides as college textbooks, and among his valuable archæological works are 'Britanno-Roman Inscriptions' (1863), and 'Christian Epitaphs of the First Six Centuries.'

MacCAULEY, mą kâl'ĭ, **Clay,** American Unitarian clergyman and author: b. Chambersburg, Pa., 8 May 1843. He was graduated at Princeton in 1864 and at the Theological Seminary of the Northwest, Chicago, in 1867, and read philosophy and divinity at Heidelberg, 1873. In the Civil War, 1862–63, he was a lieutenant in the 126th Pennsylvania regiment, and served on the staff of Gen. S. D. Sturgis, and in 1864–65 was a member of the Christian Commission in the United States army. In 1880–81 he was a collaborator of the Bureau of Ethnology among Indians east of the Mississippi. Entering the Unitarian ministry he was pastor of the First Church, Waltham, Mass., 1869–72, and of All Souls Church, Washington, D. C., 1876–81. From 1890 to 1900 and again after 1909 he served as director of the Japan mission of the Unitarian Association, and from 1891 to 1899 was president of the College for Advanced Learning at Tokio and professor there of philosophic and historic theology. He lectured on Japan in 1904–09. He has written 'Christianity in History' (1891); 'The Religious Problem of Japan — How to Solve it?' (1894); 'Introductory Course in Japanese' (1896; 1905); 'Japanese Literature' (1899); 'A Day in the Very Noble City, Manila' (1899); and has published 'Single Songs of a Hundred Poets' (1899) and other translations from the Japanese; 'Florida Seminoles' (1884); 'Present Religious Condition of Japan' (1902); 'Unitarian Mission to Japan' (1909); 'A Daughter of the Samurai' (1910); 'Thought and Fact for To-day,' also in Japanese (1911); 'The Memorial Most Worthy of Our Patriot Dead' (1911); 'The English Language in the New Georgean Era' (1911); 'Charles Dickens: An Appreciation' (1912); 'The Faith of the Incarnation' (1913); 'Memories and Memorials' (1914); 'The American-Japanese Problem as a Race Question' (1915), and contributions to periodicals in Japan and the United States.

McCAUSLAND'S RAID, an incursion of the Confederate general McCausland into Maryland and Pennsylvania, the chief incident of which was the burning of Chambersburg, Pa. General Early having defeated General Crook in the battle of Kernstown (q.v.), 24 July 1864, and driven him and Averell across the Potomac at Williamsport, ordered General McCausland with his brigade and that of Bradley T. Johnson, with four guns, in all about 2,500 men, across the Potomac to raid Pennsylvania and then move to Cumberland, Md., to destroy the machinery of the Cumberland coal-pits and the repair shops, stations and bridges of the Baltimore and Ohio Railroad. Early says he wished to open the eyes of the people of the North to the enormities of its armies, by an example in the way of retaliation, and that Chambersburg, Pa., was selected as the town on which retaliation should be made. The sum of $100,000 in gold, or $500,000 in currency was to be demanded of it, in default of which McCausland was ordered to burn the town. Under cover of demonstrations at Williamsport and other points along the Potomac, McCausland crossed the river at McCoy's Ferry, near Clear Spring, above Williamsport, on the 29th, and made straight for Chambersburg, about 25 miles northeast. He met with but little opposition and, on the morning of the 30th, rode into the fated town and demanded the sum fixed by Early. It could not immediately be raised; he knew that General Averell was close upon him, and setting fire to the place, laying a greater part of it in ashes, he hastily marched westward to McConnellsburg and encamped. Averell, who was in Hagerstown when he heard that McCausland had crossed the Potomac, started in pursuit with about 2,600 cavalry, went through the burning town and, a few miles from McConnellsburg, struck McCausland's rear, diverting him from his intended march on Bedford and forcing him back to the Potomac at Hancock, which was reached by noon of the 31st. Here McCausland formed for battle, but upon Averell's appearance and prompt attack he withdrew westward by the National road to Cumberland, where, 1 August, he found General Kelley to oppose him, whom he attacked in the afternoon, and skirmished until night, when he retreated toward Old Town, on the Potomac, leaving 30 of his killed and wounded on the field. At Old Town he forced a crossing at daylight 2 August, capturing or dispersing a regiment of new troops from Ohio, and then moved south into the valley of the south branch of the Potomac, by way of Springfield and Romney. From Romney, 4 August, he moved on New Creek and attacked the garrison, but after a stubborn fight was repulsed, leaving 25 dead on the field, the Union loss being 36 killed and wounded. McCausland then withdrew to near Moorefield, where the south fork joins the south branch of the Potomac, and considering himself safe from pursuit went into camp. Averell, who had remained at Hancock when McCausland drew off toward Cumberland, crossed the Potomac on the 4th, and, after a forced march through Bath, Springfield and Romney, before sunrise of the 7th surprised McCausland in his camp and routed him, capturing his four guns, nearly all his wagons, several hundred horses, three battle-flags, many small arms and 420 prisoners, including 38 officers. McCausland's loss in killed and wounded was about 100. Averell's loss was 41 killed and wounded. McCausland's shattered command fled to the mountains and made its way in squads to the Shenandoah Valley, finally assembling at Mount Jackson. "This affair," says Early, "had a very damaging effect upon my cavalry for the rest of the campaign." Consult 'Official Records' (Vols. XXXVII, XLIII); Pond, 'The Shenandoah Valley in 1864'; Early, 'The Last Year of the War for Independence.'

MacCHESNEY, măk-chĕ'nē, **Clara T.,** American artist: b. Brownsville, Cal., 1861. She studied at the San Francisco Art School, at the Gotham Art School, New York, and at the Colarossi School in Paris. Her genre work has received favorable recognition. At the World's Columbian Exposition in 1893 she was awarded two medals and she received the Dodge prize, New York, in 1894. Since then she has also received three medals from the Colarossi School, a gold medal from the Philadelphia Art Club and the second Hallgarten prize from the National Academy of Design, New York. At the Paris Exposition of 1900 she exhibited 'Pomegranates' and 'The Old Blind Fiddler.'

McCHESNEY, Dora Greenwell, American author: b. Chicago, 1 Oct. 1871. She was privately educated, chiefly by her mother, in whose company she traveled and read widely, making special acquaintance with German literature, Italian art and Roman antiquities, also becoming deeply interested in studying the English Civil War, with characters and incidents of which her writings largely have to do. Among these are 'Kathleen Clare, Her Book, 1637–1641' (1895); 'Miriam Cromwell, Royalist: a Romance of the Great Rebellion' (1897); 'Beatrix Infelix: a Summer Tragedy in Rome' (1898); 'Rupert, by the Grace of God: the Story of an Unrecorded Plot' (1899).

MACCHIAVELLI, Niccolo. See MACHIAVELLI, NICCOLO.

McCHORD, mă-kôrd, **Charles Caldwell,** American lawyer: b. Springfield, Ky., 3 Dec. 1859. He was educated at Centre College (now Central University), Danville, Ky., and was admitted to the bar in 1882, engaging in practice at Louisville, Ky. He was a member of the law firm, McChord, Hines and Norman, until 1911. He was prosecuting attorney of Washington County, Ky., in 1886–92, and was chairman of the Kentucky Railroad Commission in 1892–95 and in 1899–1907. He served in the Kentucky senate in 1895–99 and introduced the railroad rate bill enacted by the legislature. He was president of the National Association of Railroad Commissioners in 1906–07, and from 1910 was a member of the Interstate Commerce Commission, serving as chairman in 1915.

McCLAIN, mą-klān, **Emlin,** American jurist: b. Salem, Ohio, 26 Nov. 1861; d. 25 May 1915. He was graduated at the State University of Iowa in 1871, later studying law there, and until 1881 he practised law in Des Moines. He was appointed professor of law at the University of Iowa in 1881 and was subsequently vice-chancellor and chancellor there. He served as judge of the Supreme Court of Iowa in 1901–12, and was its chief justice in 1906–12.

From 1913 until his death he was professor of law at the Leland Stanford, Jr., University. He was a contributor to the 'American Encyclopedia of Law and Procedure,' wrote extensively for the law magazines and was author of 'McClain's Annotated Statutes of Iowa' (1880); 'A Treatise on Criminal Law as Now Administered in the United States' (1897); 'Constitutional Law in the United States' (1905; 2d ed., 1910), etc.

McCLELLAN, mą-klĕl'ąn, **George Brinton,** American soldier: b. Philadelphia, 3 Dec. 1826; d. Orange, N. J., 29 Oct. 1885. He was educated at the University of Pennsylvania and at West Point where he was graduated in 1846. He was brevetted second lieutenant of engineers and immediately ordered to Mexico, where as lieutenant of a company of sappers, miners and pontoniers he rendered valuable service. He was at the siege of Vera Cruz, at Cerro Gordo and in the attack on the City of Mexico; at Contreras and Churubusco he won the brevet of first lieutenant and was brevetted captain for gallantry at Chapultepec. After the war he was ordered to West Point as captain of field labors and instructor in bayonet exercise. In 1851 he was ordered to Fort Delaware to superintend its construction. The next year he accompanied Capt. Randolph B. Marcy (later his father-in-law) on an expedition to explore the Red River, and in September 1852 was ordered as senior engineer to Texas, to survey the rivers and harbors of that State. In 1853 he was detailed for the examination of the western part of the proposed route for a Pacific railroad; and explored the Yakima Pass and various portions of the Cascade Range, and the most direct route to Puget Sound, his report forming the first volume of the 'Pacific Railroad Surveys' published by the government. He was soon afterward detailed to investigate the railroad system of the United States, with a view to obtain all the necessary data on construction, equipment and management for the successful operation of the Pacific railroad. Of the result of his proceedings he presented a full report in November 1854. In March 1854 he was promoted to captain in the 1st Cavalry. In the spring of 1855 he was sent to Europe to study the organization of European armies and observe the war in the Crimea. He wrote one volume of the report of the commission, which was republished in Philadelphia under the title of 'The Armies of Europe' (1861). He resigned his commission in January 1857, and was for three years vice-president and engineer of the Illinois Central Railroad, at the end of which time he became general superintendent of the Ohio and Mississippi Railroad, and two months later president of the eastern division of the same road. He held this office when the Civil War broke out in 1861. He then received a commission as major-general from the governor of Ohio and proceeded to organize the volunteers of the State; the States of Ohio, Illinois, Indiana, the western part of Pennsylvania and western part of Virginia were united to form the Department of the Ohio under his command. About 1 June his army began to cross the Ohio River into Virginia; on the 18th McClellan himself left Cincinnati to take the field, and by the middle of July the whole northwestern part of the State had been cleared of Confederate troops and the Wheeling legislature left free to organize a loyal government.

On 22 July, McClellan was summoned to Washington to take command of the Army of the Potomac, and commissioned as major-general of the United States army. On his arrival at Washington he found everything in disorder and the troops badly demoralized in consequence of the defeat at the first battle of Bull Run, and devoting himself to the organizing and disciplining of his army, he soon brought order out of chaos and had his troops well equipped and in excellent condition. On the retirement of General Scott from active service, McClellan was appointed general-in-chief of the armies of the United States. Plans were then taken under discussion for an attack upon Richmond, and here difference of opinion arose between the President and the Secretary of War and McClellan; the plan finally accepted made the base of supplies on Chesapeake Bay, with line of march upon Richmond from the Peninsula. The army did not move until March 1862, and in the meantime discontent had arisen at Washington on account of the delay. On 10 March the army advanced toward Manassas, but as the Confederates had evacuated that place and had fallen back upon Richmond, the real campaign was begun by transporting the troops to Fortress Monroe. On 11 March, some two weeks before leaving Washington, McClellan was deprived of the chief command, leaving him the command of only the Army of the Potomac; McDowell's corps and other reinforcements on which he had relied were also removed from his army for the defense of Washington. He besieged Yorktown for a month, though opposed by a much inferior Confederate force, whose numbers he greatly overestimated; when Yorktown was evacuated 4 May, he advanced toward Richmond, defeating the Confederates at Williamsburg and Hanover Court House. After reaching the Chickahominy, he found his lines too extended to protect from attack and advance upon Richmond, and decided to retreat to the James River; then followed the Seven Days' Battles which ended when the Federal forces reached Hampton's Ferry. From here McClellan had planned a new advance, but dissatisfaction against him was so strong that he was relieved of his command and ordered to evacuate the Peninsula. (See PENINSULAR CAMPAIGN). He was then put in command of the fortifications of Washington, till after the second battle of Bull Run, when he succeeded General Pope, again taking command of the Army of the Potomac. On Lee's invasion of Maryland, McClellan marched to attack him and fought the battle of Antietam (q.v.), forcing the Confederates to retreat from their position and following them as far as the Potomac. He did not, however, cross the Potomac in pursuit, as he was awaiting supplies; this failure to follow up his victory caused him to be deprived of his command and he was ordered to Trenton, N. J. He took no further part in the war.

In 1864 he was Democratic nominee for President of the United States, and was defeated, the electoral vote stood 212 for Lincoln against 21 for McClellan, but McClellan's popular vote was 1,800,000. He remained abroad from 1864–68, and on his return had charge of the construction of the Stevens' floating battery,

which, however, was not completed on account of financial difficulties. In 1870 he was appointed chief engineer of the department of docks for New York City, in 1877 he was elected governor of New Jersey, and during his administration reduced and finally abolished the State tax, improved the system of public education and built up an effective militia; he declined a renomination. As a general, McClellan won the confidence and aroused the enthusiasm of his soldiers to an unusual degree; he excelled as an organizer of armies and had a thorough knowledge of the science of tactics, as shown in his plans of campaign, but in actual campaigning lacked aggressiveness and the power to act quickly and take advantage of his enemy's mistakes. He wrote besides the reports mentioned 'Manual of Bayonet Exercise' (1852) and 'Report on the Organization and Campaigns of the Army of the Potomac' (1864). Consult 'McClellan's Own Story,' edited by W. C. Preine (New York 1887); Michie, P. S., 'General McClellan' (in 'Great Commander' series ib. 1901); Rhodes, J. F., 'The First Six Weeks of McClellan's Peninsular Campaign' (Boston 1896); Ropes, J. C., 'Story of the Civil War' (Vol. II, New York 1895); Webb, A. S., 'Peninsula: McClellan's Campaign of 1862' (ib. 1881), and Bradford, Gamaliel, 'Union Portraits' (in *Atlantic Monthly* Vol. CXIV, Boston 1914).

McCLELLAN, George Brinton, American politician: b. Dresden, Saxony, 23 Nov. 1865. He is the son of Gen. G. B. McClellan (q.v.). He was graduated from Princeton in 1886; and took up journalism, working as a reporter and in editorial positions for several of the New York City dailies. He studied law and was admitted to the bar in 1892. From 1889 to 1892 he was treasurer of Brooklyn Bridge. Early active in politics as a Democrat, he was elected president of the board of aldermen in 1893 for a term of two years. He was elected to Congress in 1894 and for four succeeding terms, and was a member of the House Committee of Ways and Means. In Congress he has been an advocate of tariff reform, and though opposed to an imperialistic policy did not sympathize with the attacks on the conduct of the United States army in the Philippines. In 1903 he was nominated for mayor of Greater New York by the regular Democratic organization (Tammany Hall), and was elected by 63,000 majority. In 1905 he was again elected mayor by 3,472 plurality. In 1908 he succeeded Grover Cleveland as Stafford Little lecturer on public affairs in Princeton University, and in 1912 he was elected professor of economic history in Princeton University, a chair which he still occupies. He is the author of 'The Oligarchy of Venice' (Houghton-Mifflin & Co., 1904); 'The Heel of War' (G. W. Dillingham & Co., 1916) and of numerous magazine and newspaper articles on political, historical and economic subjects. He has received the honorary degree of LL.D. from Princeton, Union and Fordham universities.

McCLERNAND, mą-klĕr'nąnd, **Edward John,** American soldier: b. Jacksonville, Ill., 29 Dec. 1848. In 1870 he was graduated at West Point and stationed on the Western frontier for the nine following years, in which he did rescue work after the destruction of Custer's command, and had a share in the capture of Chief Joseph and the Nez Percés Indians. In 1898 he was appointed lieutenant-colonel and adjutant-general of volunteers, served with the army of Santiago de Cuba in 1898, and was ordered to the Philippine Islands, where he routed the insurgents at Cebu, 8 Jan. 1900. He was subsequently put in command of the second district in the department of the Visayas, including the islands of Cebu, Mactan, Baulayan and the Camotes. He was acting military governor from 19 April 1900 to 28 May 1901. In 1905 he went as attaché with the Japanese army in Japan and Manchuria. Later he was successively commander of the 1st United States Cavalry, president of the Cavalry Equipment Board, Rock Island Arsenal. He retired from active service 29 Dec. 1912.

McCLERNAND, John Alexander, American lawyer: b. Breckinridge County, Ky., 30 May 1812; d. Springfield, Ill., 20 Sept. 1900. He was admitted to the Kentucky bar in 1832, but in the same year volunteered for military service against the Sac and Fox Indians. Five years later he was elected to the Illinois legislature, and subsequently sat for two terms in Congress. During the Civil War he served with distinction at the battle of Fort Donelson as brigadier-general of volunteers, and was promoted major-general. He led a division at the battle of Shiloh, relieved Sherman before Vicksburg in 1863 and was in command of the 13th Army Corps until 1864, when he resigned. In 1870 he was appointed circuit judge for the Sangamon, Ill., district. He presided at the National Democratic Convention in Saint Louis, 1876, and was appointed by President Cleveland member of the Utah Commission.

MACCLESFIELD, măk'k'lz-fēld, England, market town and municipal borough in Cheshire, 166 miles northwest of London, on the river Bollin and on the London and Northwestern, North Staffordshire and Great Central railways. In the Domesday Survey it is recorded as part of the estate of the Earl of Chester and is reputed to have become a free borough in the beginning of the 13th century. The first recorded charter, however, dates from 1261. The church of Saint Michael was founded in 1278 and was partially rebuilt and considerably enlarged in 1740. A commercial school was erected in 1840 from the funds of the free grammar school founded in 1502. There are slate and stone quarries in the vicinity and brewing is carried on; but the chief manufactures of the town are in silk and cotton textiles. The first silk mill was set up in 1755, while the manufacture of cotton was begun in 1785. The town has modern water and gas works, an insane asylum, public library, parks, baths and markets. Pop. about 34,797.

McCLINTOCK, mą-klin'tŏk, **Emory,** American actuary: b. Carlisle, Pa., 19 Sept. 1840. He was graduated from Columbia University in 1859, and afterward took special studies in chemistry. He was tutor in mathematics at Columbia 1859–60. He was consular agent at Bradford, England, 1863–66, actuary of the Asbury Life Insurance Company, New York, 1867–77, and of the Northwestern Mutual Life Insurance Company, Milwaukee, 1871–89. From 1889 to 1911 he was actuary of the Mutual Life Insurance Company, New York, of which he was vice-president in 1905–

11, trustee after 1905 and consulting actuary after 1911. He was president of the American Mathematical Society in 1890–94 and of the Actuarial Society of America in 1895–97. He is a Fellow of the American Academy of Arts and Sciences and Fellow of the Institute of Actuaries, London. He has contributed to mathematical journals.

McCLINTOCK, Sir Francis Leopold, English admiral: b. Dundalk, Ireland, 1819; d. 17 Nov. 1907. He entered the British navy in 1831 and was commissioned lieutenant in 1845. He sailed on four Arctic voyages, being sent out in 1848 to search for Sir John Franklin, and again in 1850 and 1852, without discovering any traces of the explorer. In 1857 he renewed the search as commander of the *Fox* and brought back documentary and other evidence of Franklin's death. For his services as an Arctic explorer he was knighted in 1860, and in 1884 made admiral. He wrote 'Voyage of the Fox' (1859).

McCLINTOCK, John, American scholar: b. Philadelphia, Pa., 27 Oct. 1814; d. Madison, N. Y., 4 March 1870. He was graduated at the University of Pennsylvania in 1835. He entered the ministry of the Methodist Episcopal Church and from 1836 to 1851 was professor of mathematics and of Greek and Latin in Dickinson College. From 1848 to 1856 he edited the *Methodist Quarterly Review.* He was delegate to several conferences abroad and in 1857 became pastor of Saint Paul's Church, New York. Three years later he was appointed preacher of the American Chapel in Paris. He advocated the Union cause in the Civil War, and after his return to America in 1864 was again pastor of Saint Paul's, New York, but failing health compelled his resignation and he retired to Germantown, Pa. He removed to New Brunswick, N. J., in 1866 and became chairman of the Central Centenary Committee of the Methodist Episcopal Church. For the last three years of his life he was president of the Drew Theological Seminary. He was joint editor and compiler with James Strong of the 'Cyclopedia of Biblical, Theological and Ecclesiastical Literature' which goes by their name, the last volume of which was published in 1895. Among his other works are 'An Analysis of Watson's Theological Institutes' (1850); and 'Temporal Power of the Pope' (1853). He also issued a translation of Neander's 'Life of Christ' (1847); 'Sketches of Eminent Methodist Ministers' (1863); a translation of Bungener's 'History of the Council of Trent' (1851); 'Living Words,' sermons (1871) and 'Lectures on Theological Encyclopædia and Methodology' (1873). Consult the 'Life' by Crooks (New York 1876).

McCLOSKEY, mą-klŏs'kĭ, **John,** American Roman Catholic prelate: b. Brooklyn, N. Y., 20 March 1810; d. New York, 10 Oct. 1885. His secondary and collegiate studies were made at Mount Saint Mary's College, Emmitsburg, Md., and his post-graduate studies in France and Rome. At 24 he was ordained priest and on returning to America was assigned to Saint Joseph's Church, New York City. When Saint John's College, at Fordham (now a part of New York City), was opened in 1841, he was made its first president, but in the next year he returned to parish work. In 1844 he was appointed coadjutor to Bishop Hughes of the diocese of New York, and consecrated titular bishop of Axiere; and three years later was appointed bishop of Albany, a diocese just created from a part of the diocese of New York. For 17 years he worked for the upbuilding of the Albany diocese and the good of his people. He built the cathedral of the Immaculate Conception at Albany, Saint Joseph's Theological Seminary at Troy, established several new parishes and founded educational and charitable institutions, including hospitals, orphanages, homes for the aged and reformatories. He succeeded Archbishop Hughes in the archiepiscopal see of New York, 6 May 1864. The result of his labors in the archdiocese of New York remains his greatest monument. He was made a cardinal in 1875, under the title of Santa Maria supra Minervam. He was in attendance at the Vatican Council (q.v.) and a member of the committee on discipline. He was summoned to Rome February 1878 to attend the conclave for the election of a Pope but was too late to cast a vote, Leo XIII having been elected a few hours before his arrival. Cardinal McCloskey was noted for his gentleness, firmness, profound scholarship and great executive ability. Consult 'The Life of John Cardinal McCloskey, First Prince of the Church in America: 1810–85.'

McCLOSKEY, William George, American Roman Catholic prelate: b. Brooklyn, N. Y., 10 Nov. 1823; d. 17 Sept. 1909. Upon completing his studies at Mount Saint Mary's College, Emmitsburg, Md., he turned to the law, but subsequently entered Saint Mary's Theological Seminary, where he pursued a six years' course in philosophy and theology, being ordained priest 6 Oct. 1852. His first appointment was as assistant in the church of the Nativity. In 1853 he was named professor of Latin and Sacred Scriptures in Mount Saint Mary's College and in 1857 became director of the theological seminary. When the American College was formally opened in Rome Pope Pius IX chose Dr. McCloskey its first president, 8 Dec. 1859, a position which, for eight years, he filled to the utmost satisfaction. In 1865 he visited America in the interests of the institution under his charge and succeeded in collecting funds sufficient for its permanent endowment. Upon the death of Bishop Lavialle, Pope Pius IX appointed Dr. McCloskey to the see of Louisville, Ky., and he was consecrated at Rome 24 May 1868. During his 36 years' administration numerous churches, schools and religious institutions were built throughout his diocese.

McCLUNG, mă-klung, **Clarence Erwin,** American zoologist: b. Clayton, Cal., 5 April 1870. He was graduated at the University of Kansas in 1892 and later studied at Columbia and at the University of Chicago. He was a member of the faculty of the School of Medicine at the University of Kansas in 1897–13 and since then has been professor of zoology and director of the zoological laboratory at the University of Pennsylvania. He was a member of the embryological staff at Wood's Hole, Mass., in 1893, and headed scientific expeditions to Oregon, Washington and western Kansas. He is author of articles on heredity and cretaceous fish of Kansas; and is associate editor of the *Journal of Morphology.*

McCLURE, mą'kloor', **Alexander Kelly,** American journalist: b. Sherman's Valley, Perry County, Pa., 9 Jan. 1828; d. 1909. He was reared on a farm, educated at home and apprenticed to a tanner in 1842, soon after began to write for the Perry *Freeman* and edited and published the *Juniata Sentinel* at Mifflin, Pa., in the Whig interest, 1846–50. He then published (1850–56) the Chambersburg *Repository,* which he made influential in the cause of anti-slavery. He was State superintendent of printing in 1855; a member of the State convention of 1855 which met at Pittsburgh to organize the Republican party; in 1856 was admitted to the bar and was a delegate to the first Republican National Convention in Philadelphia. In 1857–58 he sat in the legislature as a Republican and was State senator in 1859. As leader of the Pennsylvania delegation in the Republican National Convention of 1860 he aided in the nomination of Abraham Lincoln. In 1862–64 he again published the Chambersburg *Repository,* and in the latter year served as assistant adjutant-general in charge of the draft in Pennsylvania. Two years later he was again a member of the legislature, and in 1868–73 practised law in Philadelphia. He was chairman of the State delegation to the Liberal Republican Convention in 1872, and of the Liberal Republican State Committee, and in that year entered the State senate. In a close election in 1873 he was defeated as an independent candidate for mayor of Philadelphia. In 1875 he established the Philadelphia *Times,* of which he was editor-in-chief till 1901. He published 'Three Thousand Miles Through the Rocky Mountains'; 'Our Presidents and How We Make Them' (1901); 'Recollections of Half a Century' (1902); 'Old Time Notes of Pennsylvania' (2 vols., 1906), etc.

McCLURE, James Gore King, American Presbyterian clergyman: b. Albany, N. Y., 24 Nov. 1848. He was graduated at Yale in 1870, at the Princeton Theological Seminary in 1873 and ordained as a Presbyterian minister in 1874. He was settled (1874–79) at New Scotland, N. Y., and at Lake Forest, Ill., 1881–1905. From 1897 to 1901 he was president of Lake Forest University. Since 1905 he has been president of McCormick Theological Seminary, Chicago. He has written 'Possibilities' (1896); 'The Man Who Wanted to Help' (1897); 'The Great Appeal' (1898); 'Environment' (1899); 'For Hearts that Hope' (1900); 'A Mighty Means of Usefulness' (1901); 'Living for the Best' (1903); 'The Growing Pastor' (1904); 'Loyalty, the Soul of Religion' (1905); 'Supreme Things' (1907), etc.

McCLURE, Sir **Robert John Le Mesurier,** English vice-admiral: b. Wexford, Ireland, 28 Jan. 1807; d. London, 17 Oct. 1873. He began his naval career in 1824, and in 1836 under Sir John Ross made his first voyage to the Arctic regions. Again he joined an expedition sent to discover the Northwest Passage in 1848, that of Sir James Clark Ross. Two years later he was placed in command of a Franklin search expedition, discovered Prince of Wales Strait which connects the Atlantic and Pacific and thus accomplished one object of the expedition, the discovery of the Northwest Passage. He was forced, however, to abandon his ship, and completed the Northwest Passage by land. On his return he was knighted. From his journals was published 'The Discovery of the Northwest Passage' (by Capt. Sherard Osborne, 1856).

McCLURE, Samuel Sidney, American editor and publisher: b. Frocess, County Antrim, Ireland, 17 Feb. 1857. He was graduated at Knox College, Galesburg, Ill., in 1882. In 1882–83 he was editor and manager of the *Wheelman* for the Pope Manufacturing Company, and in the following year was connected with the De Vinne Press, New York. In 1884 he established a newspaper syndicate which has grown to great proportions and assumed distinctive importance in the publishing world. In 1893 he founded *McClure's Magazine,* which through his able administration soon stood in the front rank of American periodicals. In 1899 he established the publishing house of McClure, Phillips and Company, New York, and was its president until the business was acquired by Doubleday, Page and Company. The magazine was taken over by the McClure Publications, Incorporated. Since 1893 Mr. McClure has been president of the S. S. McClure Company and since 1894 he has been a trustee of Knox College. Consult Mr. McClure's very interesting 'My Autobiography' (New York 1914).

McCLURG, ma-kloorg', **Alexander Caldwell,** American publisher: b. Philadelphia, 1834; d. Saint Augustine, Fla., 15 April 1901. He was graduated at Miami University, Oxford, Ohio, in 1853, engaged in business with S. C. Griggs and Company, publishers, in Chicago and in 1862 entered the Union army. He was captain in the 88th Illinois regiment of infantry, rose to the rank of colonel, was made brevet brigadier-general, and in the Atlanta campaign and during Sherman's great march served as chief of staff to the 14th corps. Returning from the war, he was admitted to partnership in the publishing house above mentioned, and some years later established the firm of Jansen, McClurg and Company, afterward A. C. McClurg and Company. The business of the house prospered, and in 1899 the company was reorganized, the co-operative principle adopted and the employees, among whom the stock was largely distributed, were granted easy terms for increasing their investments.

McCLYMONT, măk-klī'mŏnt, **James Alexander,** Scottish theologian: b. Girvan, Ayrshire, 26 May 1848. He was educated at the universities of Edinburgh and Tübingen, entered the ministry and in 1874–1913 he was in charge of Holburn Church, Aberdeen, when he retired. He was a member of the general committee of the Church of Scotland, and was a chaplain in the territorial force, retired with the rank of colonel. He collaborated in translating Beck's 'Pastoral Theology of the New Testament' and was author of 'The New Testament and its Writers' (1892; 2d ed., 1893); 'The Church of Scotland' (1893); 'New Testament Criticism' (1913), etc.

MacCOLL, mą-kŏl', **Evan,** Canadian poet: b. Kenmore, Argyleshire, Scotland, 21 Sept. 1808; d. Toronto, 1898. He emigrated to Canada in his 42d year and became known as the poet of the Scottish colony at Kingston. He wrote with fluency in Gaelic and his 'Clàreach nam Beann' created much enthusiasm among

his compatriots. He is also author of many English poems, such as 'My Rowan Tree'; 'The Mountain Minstrel' (1887); and 'Poems and Songs' (1888).

MacCOLL, Malcolm, British theologian and author: b. Glenfinan, Inverness-shire, Scotland, 27 March 1831; d. London, 5 April 1907. He studied at Trinity College, Glenalmond, and at the University of Naples and was ordained in the Scottish Episcopal ministry in 1857. He filled curacies at different London churches, was chaplain to the British Ambassador at Petrograd in 1862–63, in southern Italy in 1867–69, and at Addington, Bucks. His hearty support of Gladstone won for him in 1871 recognition in the form of the living of Saint George's, Botolph Lane, and he was further rewarded with a canonry at Ripon in 1884. He was a keen controversialist in both ecclesiastical and political fields, and was actively engaged in newspaper and pamphlet writing in support of High-Church doctrines and of Gladstone's Irish policy. He traveled extensively and was prominently concerned with the airing of Bulgarian and Armenian affairs after a visit in those countries in 1876. Author of 'Mr. Gladstone and Oxford' (1865); 'Lawlessness, Sacerdotalism and Ritualism' (1875); 'Reasons for Home Rule' (1886, nine eds.); 'The Reformation Settlement' (10th ed., 1901); 'The Royal Commission and the Ornaments Rubric' (1906), etc.

McCOMB, mă-kōm, **John,** American engineer and architect: b. New York, 17 Oct. 1763; d. there, 25 May 1853. He was of Scottish descent and became prominent for his designs for both public and private buildings in New York, Philadelphia and the Eastern States. He designed the front of the old government house in New York in 1790, Saint John's Church, the Murray and Bleecker Street churches in that city, and was supervising architect of the city of New York at the time of the erection of the city hall. He is supposed to have designed the city hall with the assistance of a Frenchman named Mangin.

McCOMBS, William Frank, American lawyer: b. Hamburg, Ark., 26 Dec. 1875. He was graduated at Princeton in 1898 and at the Harvard Law School in 1901. He engaged in practice in New York City, and as chairman of the Democratic National committee in 1912–16 he managed the campaigns of Woodrow Wilson for President. He declined the ambassadorship to France in March 1913.

McCONNEL, mą-kŏn'ĕl, **Francis John,** American Methodist-Episcopal bishop: b. Trinway, Ohio, 18 Aug. 1871. He was educated at the Ohio Wesleyan University and entered the ministry in 1894. He held pastorates in Massachusetts at West Chelmford; Newton Upper Falls; Ipswich; Haward street, Cambridge; and at New York avenue, Brooklyn. In 1909–12 he was president of De Pauw University, and in 1912 he was elected bishop. Author of 'The Diviner Immanence' (1906); 'Religious Certainty'; (1910); 'Personal Christianity' (1914), etc.

McCONNELL, Samuel D., American Protestant Episcopal clergyman and author: b. in Westmoreland County, Pa., in 1846. He was graduated at Washington and Jefferson College in 1868, and was ordained a priest in 1873; was rector of Saint John's Church, Erie, Pa., 1872–73; held rectorships at Watertown, Conn. (1873–76), and Middletown, Conn. (1876–82); became rector of Saint Stephen's Church, Philadelphia, in 1882; of Holy Trinity Church, Brooklyn, N. Y., in 1896; and from 1902 to 1905 was rector of All Souls' Church, New York City. He retired in the latter year. He has published a 'History of the American Episcopal Church' (1890); 'Sons of God' (1891); 'Sermon Stuff' (1888, 1895); 'A Year's Sermons' (1896); 'The Open Secret'; 'The Next Step in Christianity'; 'Essays, Practical and Speculative' (1900); and 'The Evolution of Immortality' (1901); 'Christ' (1902); 'Christianity' (1905).

McCONNELSVILLE, Ohio, village and county-seat of Morgan County, on the Muskingum River, 27 miles below Zanesville and 30 miles northeast of Marietta, on the Baltimore and Ohio Railroad. It is situated in a fertile agricultural region, has extensive undeveloped coal resources, and has flour and lumber mills, a sash and door factory and tobacco manufactories. Pop. 1,831.

McCOOK, mą-kŭk, **Alexander McDowell,** American soldier: b. Columbiana County, Ohio, 22 April 1831; d. Dayton, Ohio, 12 June 1903. He was graduated at West Point in 1853, and with the commission of second lieutenant of the 3d Infantry was ordered to New Mexico. In 1861 he gained his captaincy and saw much service during the Civil War. He commanded the Ohio volunteers at Bull Run and rapidly gained promotion, being appointed major-general of volunteers in 1862. His brilliant military reputation was made at the battles of Shiloh, Murfreesboro, Chickamauga, etc., and in 1865 he was brevetted brigadier-general in the regular army. He was subsequently placed in command of the military school at Fort Leavenworth, was commissioned major-general in 1894 and retired the following year. He represented the United States at the coronation of the Tsar in 1896 and in 1898–99 was a member of a commission appointed by President McKinley to investigate the work of the War Department during the War with Spain. General McCook came of a fighting family. He was the son of Daniel McCook (q.v.) who was killed by Morgan's guerillas in 1863. Seven of the general's brothers took part in the War for the Union, three of whom, like their father, were killed. Four of the eight McCook brothers attained the rank of general. Consult Hosmer, J. K., 'The Appeal to Arms' (New York 1906); id., 'Outcome of the Civil War' (ib. 1906); Rhodes, J. F., 'History of the United States' (ib. 1907).

McCOOK, Anson George, American soldier and politician: b. Steubenville, Ohio, 10 Oct. 1835. He took part in the Civil War as captain in 2d Ohio Infantry. Became sergeant within three months and was at the first battle of Bull Run. He subsequently served as major, lieutenant-colonel in the Army of the Cumberland, afterward was colonel of 194th Ohio Infantry and at end of the war was brevetted brigadier-general. He was United States assessor of internal revenue at Steubenville, Ohio, and removed to New York in 1873. In 1876 he was elected as a Republican to the

45th Congress and re-elected to the 46th and 47th Congresses from the old 8th (city) district. Was elected secretary to the Senate of the United States, December 1883, and served as such until August 1893. On 1 Aug. 1895, he was appointed city chamberlain by Mayor William L. Strong, and served until the expiration of the latter's term of office, 1 Jan. 1898. He is president and director of the New York Law Publishing Company.

McCOOK, Daniel, American soldier: b. Canonsburg, Pa., 20 June 1798; d. near Buffington's Island, Ohio, 21 July 1863. Having received a college education, he removed from Pennsylvania to Ohio and settled at Carrollton. Although 63 years old at the outbreak of the Civil War, he entered the Union army, in which he served as major of volunteers. During one of the Morgan raids (q.v.) he received a wound from which he died shortly after. Eight sons of his served as officers in the Federal army, three of whom were killed in battle.

McCOOK, Henry Christopher, American clergyman and entomologist: b. New Lisbon, Ohio, 3 July 1837; d. 1911. He was graduated at Jefferson College (now Washington and Jefferson) in 1859, studied at the Western Theological Seminary, and in the Civil War he served as first lieutenant and chaplain in the 41st Illinois regiment, 1861–62. In 1862–63 he was minister of a church at Clinton, Ill.; from 1863 to 1870 labored in Saint Louis as a home missionary; and subsequently became pastor of the Tabernacle Presbyterian Church in Philadelphia, a charge he long retained. He served as chaplain of the 2d regiment of Pennsylvania volunteers in the Spanish-American War, and was chaplain of the Pennsylvania Commandery of the Loyal Legion, president of the American Entomological Society, vice-president of the Academy of Natural Sciences, Philadelphia, and president of the American Presbyterian Historical Association. His writings include 'The Gospel in Nature'; 'The Mound-Making Ants of the Alleghanies' (1877); 'The Agricultural Ants of Texas' (1879); 'Honey Ants and Occident Ants' (1882); 'Tenants of an Old Farm' (1884); 'The Women Friends of Jesus' (1885); 'American Spiders and Their Spinning-Work' (1889–93); 'The Latimers, a Scotch-Irish Historic Romance of the Western Insurrection' (1898); 'Martial Graves of Our Fellow Heroes in Santiago de Cuba'; 'Nature's Craftsmen: Popular Studies of Ants and Other Insects' (1907); 'Ant Communities and how they are Governed' (1909).

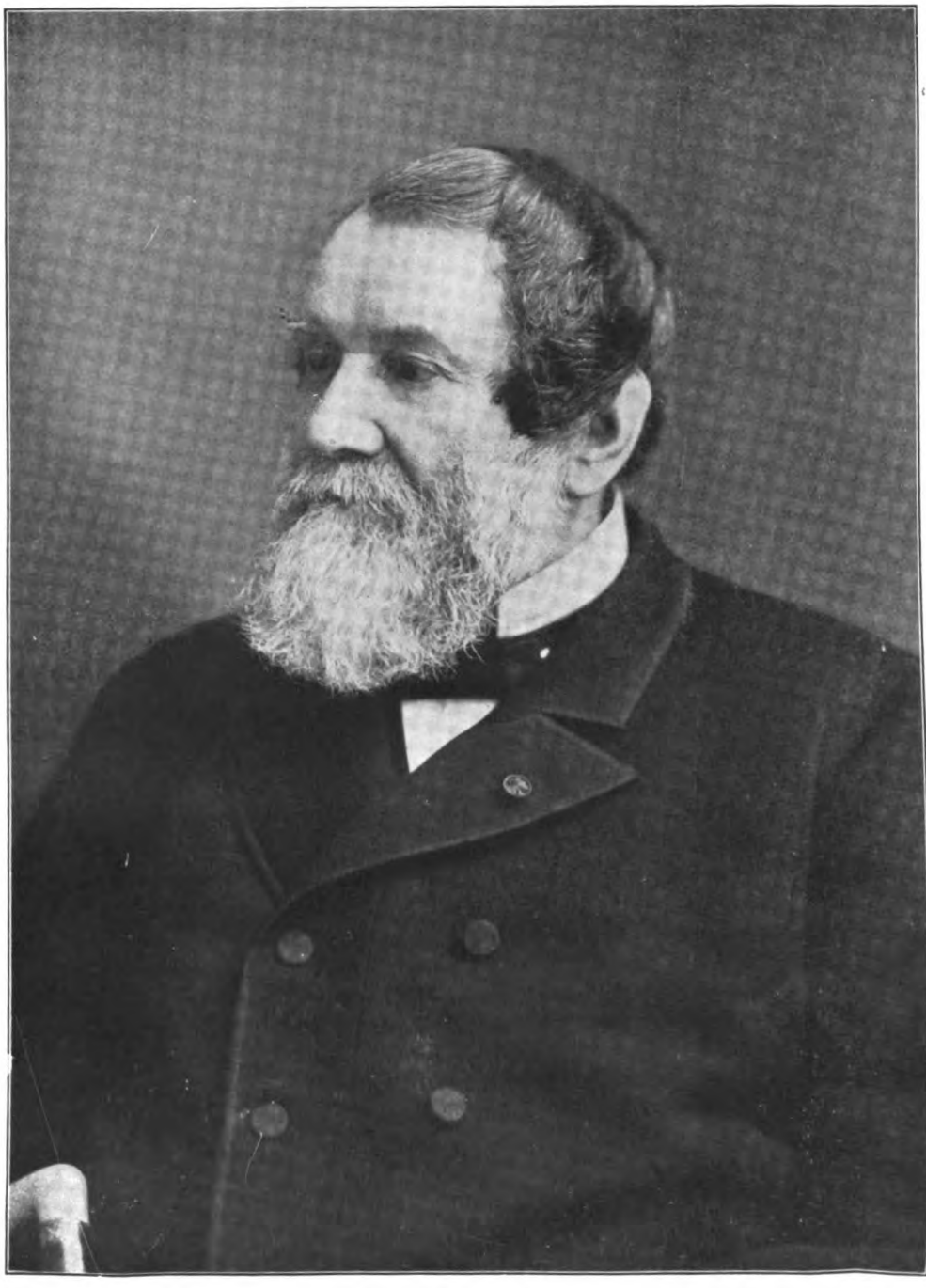
McCOOK, Neb., city, county-seat of Red Willow County, on the Republican River, and on the Chicago, Burlington and Quincy Railroad, about 230 miles west by south of Lincoln, the capital of the State. It is in a rich agricultural region. McCook owes much of its prosperity to the fact that it is the headquarters of a railroad division and has railroad shops. The sugar beet, alfalfa, wheat and corn are the principal productions of the surrounding farms. A number of cattle are raised and a large number of livestock from Willow County and vicinity is shipped from McCook. The city has a Carnegie library and a Federal courthouse and owns the waterworks. Pop. 3,765.

McCORMACK, John, Irish operatic tenor: b. Athlone, 14 June 1884. He was educated at Summer Hill College, County Sligo, Ireland, where he received a large share of his vocal training, finishing under Sabatini at Milan. He was awarded first prize at the Dublin Musical Festival in 1904, and in 1907 made his London début as Turiddu in 'Cavalleria Rusticana.' He soon afterward sang with Tetrazzini in 'Rigoletto.' He appeared at the Metropolitan Opera House in New York in 1908. Later he sang with the Chicago-Philadelphia Opera Company and with the Chicago Grand Opera Company. While highly successful in grand opera his favorite field is the concert stage where his honors and awards have rarely been equaled. He retains his operatic connection, however, appearing occasionally at the Metropolitan Opera House. He was active in raising funds for various purposes during the European War and sang frequently under the direction of the Y. M. C. A. His income tax under the war levy of 1918 was $75,000. His principal operatic rôles are Rodolfo in 'La Bohéme'; Pinkerton in 'Butterfly'; Count in 'Don Giovanni.'

McCORMICK, mą-kôr'mik, Alexander Hugh, American naval officer: b. in the District of Columbia, 9 May 1842; d. 21 Aug. 1915. He was acting midshipman at the United States Naval Academy in 1859; in April 1861 entered into active service and served in blockading squadrons throughout the Civil War. He became captain in 1892. Since the Civil War he has performed various sea duties, and has served in the department of mathematics and in that of astronomy and navigation at the Naval Academy. He was inspector of ordnance, 1876–81; made a cruise around the world, 1881–85; was assigned to the ordnance department, 1885–92; to the Asiatic station, 1892–94; was captain of the Norfolk navy yard, 1894–97; member of the armor and personnel board, 1897–98; and commandant of the Washington navy yard in 1898. In 1899 he was raised to the rank of rear-admiral, and was retired 26 March 1900.

McCORMICK, Cyrus Hall, American inventor and manufacturer: b. in Virginia, 1809; d. Chicago, 13 May 1884. He removed from his native State to Cincinnati in 1845, and two years later went to Chicago. In 1831 he invented an improved reaping-machine, which was patented and further improved, and which brought him great wealth and world-wide fame, with many decorations, medals, etc. He contributed liberally in 1859 to the establishment of the Presbyterian Theological Seminary of the Northwest, in Chicago, later called McCormick Seminary. He also endowed a chair in Washington and Lee University, Virginia.

McCORMICK, Joseph Medill, American journalist and legislator: b. Chicago, 16 May 1877. In 1900 he was graduated at Yale University. He became vice-president and publisher of the Chicago *Daily Tribune* and also served as president of the City Press Association. He opposed William Lorimer and was one of the leaders in the movement to oust the latter from his seat in the United States Senate. In 1912–14 he served as vice-chairman of the Progressive National committee and supported Roosevelt's candidacy for the Presidency at the



CYRUS HALL McCORMICK

Inventor of the Reaping Machine

Chicago Convention of 1912. In the same year Mr. McCormick was member of a committee of his party which went abroad to study social legislation. He was twice elected to the general assembly of Illinois and was a member of the 65th Congress, 1917–19, as Congressman-at-large from Illinois. In 1918 he was elected to the United States Senate.

McCORMICK, Leander James, American inventor: b. in Virginia, 1819; d. Chicago, 20 Feb. 1900. In early life he worked with his father in manufacturing reaping-machines; removed to Chicago in 1848, and entered into partnership with his brother, Cyrus Hall McCormick (q.v.), and superintended the manufacturing department of their reaping-machine plant until 1879, when the firm was incorporated as the McCormick Harvesting-Machine Company. Ten years later he retired from active business. Many of the improvements in the famous McCormick reaping-machine were made by him. In 1871 he gave an observatory with a powerful telescope to the University of Virginia.

McCORMICK, Robert Sanderson, American diplomat, father of Joseph Medill McCormick and Robert Rutherford McCormick: b. Rockbridge County, Va., 26 July 1849; d. Chicago, 16 April 1919. He was educated at the University of Virginia and entered the diplomatic service as secretary of the American legation at London in 1889–92. He was appointed first Ambassador to Austria-Hungary in July 1902; was Ambassador to Russia from December 1902 to 1905; and Ambassador to France in 1905–07. He was decorated with the Order of the Rising Sun, Japan, 1907. During the Russo-Japanese War Mr. McCormick represented the interests of Japan in Russia.

McCORMICK OBSERVATORY. See LEANDER McCORMICK OBSERVATORY.

McCORMICK THEOLOGICAL SEMINARY, in Chicago, Ill.; opened in 1830 under the auspices of the Presbyterians, as a department of Hanover Academy, at Hanover, Ind. Ten years after its opening the school was removed to New Albany, Ind. Cyrus H. McCormick (q.v.) offered the institution a liberal endowment, which generous gift caused the removal of the school to Chicago, in 1859. It was for a time known as the Presbyterian Theological Seminary of the Northwest. In 1886 the present name was taken in honor of its liberal benefactor. No fees are charged for lodging or tuition, and some of its income is used in assisting worthy and needy students. In 1917 there were connected with the seminary 18 professors and instructors and 206 students. The library contained about 41,000 volumes. The total income on productive funds and from other sources, but excluding benefactions, was about $98,000. Its buildings and grounds were valued at nearly $1,000,000 and its endowment funds at about $1,800,000.

McCOSH, mą-kŏsh', **James,** Scotch-American author and educator: b. Carskeoch, Ayrshire, 1 April 1811; d. Princeton, N. J., 16 Nov. 1894. He was educated at the University of Glasgow, which he entered at 13, and at the University of Edinburgh, where he went in 1829. He became a minister of the Church of Scotland; was settled at Arbroath in 1835, and at Brechin in 1839; but at the disruption of the Scottish Church joined the Free Church, whose organization he was active in promoting. In 1850 he published 'The Method of the Divine Government, Physical and Moral,' in which he applied the philosophy of Sir William Hamilton to questions of theology with such skill as to elicit from him the highest commendation. This work at once gave McCosh wide fame as a philosophical thinker, and in 1851 he was appointed professor of logic and metaphysics in Queen's College, Belfast, where he remained 18 years, not only discharging his professional duties, but also entering earnestly into work of religious and social improvement, through which his spirit of benevolence and his enlightened zeal for general education accomplished lasting results. In 1868 he was elected president of the College of New Jersey (now Princeton University), having previously visited this country and become impressed with its educational promise. This promise was especially bright when he assumed the presidency of Princeton, but the conditions of transition in the sphere of higher education were such as to demand consummate powers of leadership. Such powers McCosh, although a foreigner, brought to his work with most satisfying success. During the 20 years of his administration at Princeton he saw the number of students and professors more than doubled and prosperity increased in all departments. His resignation in 1888 was due to the advance of years, and he was able to continue in the chair of philosophy beyond that period. As a philosopher he maintained the principles of the Scottish metaphysicians against all empirical methods, but went beyond his predecessors in the direction of intuitionalism, although he once declared that this "rose out of rationalism as frogs rise out of the melted ice," and few orthodox theologians were abreast of him in welcoming the evolutionary features of the new biology. His writings on theology, philosophy and psychology are very numerous and include 'Typical Forms and Special Ends in Creation,' in collaboration with Dickie (1856); 'The Intuitions of the Mind Inductively Investigated' (1860); 'The Supernatural in Relation to the Natural' (1862); 'An Examination of Mill's Philosophy' (1866); 'Laws of Discursive Thought' (1869); 'Christianity and Positivism' (1871); 'The Scottish Philosophy, Biographical and Critical' (1874); 'The Development of Hypothesis' (1876); 'The Emotions' (1880); 'Psychology of the Cognitive Powers' (1886); 'Psychology of the Motive Powers' (1887); 'Realistic Philosophy Defended' (1877), and 'Our Moral Nature' (1892). Consult Dulles, J. H., 'A McCosh Bibliography' (Princeton 1895), and Sloane, W. M., 'The Life of James McCosh' (New York 1896).

McCOY, Isaac, American missionary and Indian agent: b. near Uniontown, Pa., 13 June 1784; d. Louisville, Ky., 21 June 1846. His early life was spent in Kentucky. Reared on the frontier, his educational advantages were very limited, but he was of a studious disposition. He was married at the age of 20 and was ordained to the ministry of the Baptist Church at 24, settling in Indiana about the same time. After serving eight years as pastor of a church, he entered the mission field among the Miami

Indians, in the valley of the Wabash River, in 1817. He subsequently labored among the people of the Pottawatomie and Ottawa tribes in Michigan. During the course of his work among the Indians he became impressed with expediency of removing the Indians from the contaminating influences of the white settlements. In June 1824 he submitted the matter to the consideration of the Baptist Mission Board at Washington, D. C., and was authorized to present the matter to the attention of the President of the United States. He failed to secure an audience with President Monroe, but he was successful in interviewing the Secretary of War, John C. Calhoun, under the jurisdiction of whose department was included all matters pertaining to the administration of Indian affairs. Secretary Calhoun approved of the scheme thus proposed for the establishment of an Indian Territory west of the Mississippi and became its champion. Although several tribes had removed to the West prior to that time, the government had no settled policy in regard to the matter until after Secretary Calhoun took it up officially after the suggestion was made by Mr. McCoy. In 1827 he again visited Washington, where he interviewed President John Quincy Adams and Secretary Barbour of the War Department. In 1828, Mr. McCoy and Capt. George Kennerly of Saint Louis were appointed by the Secretary of War as commissioners to conduct delegations representing the Choctaw, Creek, Pottawatomie and Ottawa tribes on an inspection of the region to be included in the proposed Indian Territory, in the performance of which duty they made two tours of the wilderness region west of Missouri and Arkansas during the late summer and autumn of 1828. During the ensuing 10 years Mr. McCoy was almost constantly in the Indian Territory (i.e., the present States of Kansas, Nebraska and Oklahoma), selecting and surveying locations for immigrant Indian tribes for the government, and, at the same time, aiding in the location and establishment of missions and schools among them. He published a brief annual pamphlet entitled *The Annual Register of Indian Affairs within the Indian (or Western) Territory,* during the years 1835 to 1838 inclusive. Previous to that he had published a pamphlet, 'The Practicability of Indian Reform.' He was also the author of 'A History of Baptist Indian Missions.' His last years were spent at Louisville, Ky., where he had charge of the work of the American Indian Mission Association.

McCOY, Joseph G., American pioneer in the overland cattle trade: b. Springfield, Ill., 20 Dec. 1837; d. Kansas City, Mo., 19 Oct. 1915. Reared on a farm, he made a specialty of feeding cattle for the beef market. At the conclusion of the Civil War the scarcity and high price of beef and the seeming impossibility of transporting the cheap cattle from the overstocked ranges of Texas to the Northern markets, because of the introduction of splenitic fever which was certain to follow among native herds, appealed to the typically American genius of McCoy for achieving that which had been reputed to be impossible. He finally proposed the establishment of a shipping point on one of the new railways, which were then being built westward across the great plains, to which the beef stock of Texas might be slowly driven northward during the grazing season, keeping well to the westward of the frontier settlements, and shipped thence by rail to the market at Chicago for immediate slaughter. This proposal, though simple, was so novel that railway managers at first refused to consider it seriously. McCoy finally induced one of the railway companies to back him in the enterprise and he arranged to build shipping pens at Abiliene, Kan. As the result of a diligent advertising campaign a few Texas ranchmen were persuaded to undertake to drive herds across the Indian Territory to the designated shipping point on the Kansas Pacific Railway, during the season of 1867. Thirty-five thousand head of beef cattle were thus marketed that season. The next year the number thus driven overland to the shipping point was increased to 75,000 head; in 1869, this number was doubled, and in 1870 the number was doubled again. When the overland cattle trade was well established the railway company soon ceased to pay the stipulated royalties to McCoy, but he continued his active interest in the live-stock business until old age forced his retirement. He published 'Historic Sketches of the Cattle Trade in the West and Southwest' (1874). He was a pioneer settler at El Reno, Okla., in 1889, and was nominated as the candidate for Territorial delegate to Congress by the convention of the Democratic party in 1890.

McCRACKAN, mą-krăk'ąn, **William Denison,** American author and lecturer: b. Munich, Germany, 12 Feb. 1864. He is of American parentage, but received his earliest education at the Latin Gymnasium, Stuttgart, Germany, Saint Paul's School, Concord, N. H., and was afterward graduated at Trinity College, Hartford, Conn., in 1885. He has written 'The Rise of the Swiss Republic' (1892); 'Romance and Teutonic Switzerland' (1894); 'Swiss Solutions of American Problems'; 'Little Idyls of the Big World' (1895); 'The Huntington Letters' (1897); 'Fair Land Tyrol' (1905); 'The Italian Lakes' (1907); 'Christian Science: Its Discovery and Development' (1912). From 1901–04 he was a member of the Christian Science Committee on Publication.

MacCRACKEN, Henry Mitchell, American Presbyterian clergyman and educator: b. Oxford, Ohio, 28 Sept. 1840; d. Orlando, Fla., 24 Dec. 1918. He was graduated at Miami University in 1857; for four years was a teacher and school superintendent; studied at the United Presbyterian Theological Seminary, Xenia, Ohio, and at the Princeton Theological Seminary, and later at Tübingen and Berlin universities. He was minister of the Westminster Church, Columbus, Ohio, 1863–67, and of the First Presbyterian Church at Toledo, Ohio, 1869–81. In 1867 he was deputy to the General Assembly of the Free Church of Scotland, and to that of the Presbyterian Church of Ireland in 1884. From 1880 to 1884 he was chancellor of the Western University, Pittsburgh, Pa., and in the latter year became vice-chancellor and professor of philosophy in the University of the City of New York, of which he was made chancellor in 1891. Since then the name of the institution has been changed to New York University, and the seat of the University College and School of Applied Science has been re-

moved to University Heights, New York City. Under his administration the Hall of Fame for Great Americans (q.v.) was added to the university, its growth and prosperity greatly increased and the extension of its work and influence has given it a leading position in the field of American education. During Dr. MacCracken's active connection with the institution it grew from a college with 91 students to a university with 4,113 students, and the property increased in value from $547,000 to $5,211,000. He resigned the chancellorship 28 Sept. 1910. Besides numerous papers on subjects of education, religion and philosophy, he published 'Tercentenary of Presbyterianism' (1870); 'Popular Sermons' (1875); 'Leaders of the Church Universal' (1879); 'John Calvin' (1888); 'Cities and Universities' (1882); 'The Scotch-Irish in America' (1884); 'A Metropolitan University' (1892); 'Educational Progress in the United States' (1893); 'Lives of Church Leaders: or Heroes of the Cross' (1900); 'The Three Essentials' (1901); 'The Hall of Fame' (1901); 'Urgent Eastern Questions' (1912).

MacCRACKEN, Henry Noble, American educator: b. Toledo, Ohio, 19 Nov. 1880. He was the son of Henry Mitchell MacCracken (q.v.) and was educated at New York and Harvard universities. He was instructor in English at the Syrian Protestant College in 1900–03; Harvard Fellow in 1907–08; instructor and afterward assistant professor of English at the Sheffield Scientific School at Yale in 1908–13. He was president of Smith College in 1913–15, and since 1915 has been president of Vassar College. Since 1917 he has been national director of the junior membership in the American Red Cross. He has written for the magazines on philology; has edited 'The Serpent of Division' (1910); 'The College Chaucer' (1913); 'Shakespeare's Principal Plays' (1914), etc. He is author of 'First Year English' (1902); and part author of 'English Composition in Theory and Practice' (1909).

MacCRACKEN, John Henry, American educator: b. Rochester, Vt., 30 Sept. 1875. He is the son of Henry Mitchell MacCracken (q.v.), and was educated at the New York University, the Union Theological Seminary and the University of Halle. He was associated with New York University as Fellow, instructor and assistant professor of philosophy in 1894–99; was president of Westminster College, Missouri, in 1899–1903; syndic and professor of politics at New York University in 1903–15; and since 1915 has been president of Lafayette College, Easton, Pa.

McCRADY, mą-krā'dĭ, **Edward,** American soldier and historian: b. Charleston, S. C., 8 April 1833; d. there, 2 Nov. 1903. He was graduated at Charleston College, admitted to the bar in 1855, and joined earnestly in the movement which led to the secession of his State. He took part in the capture of Castle Pinckney, 27 Dec. 1860, and was present at the bombardment of Fort Sumter in the following April. As captain of the first military company raised in South Carolina for the whole war, he entered the Confederate army, 27 June 1861, was made major and then lieutenant-colonel, was badly wounded at the second battle of Bull Run (or Manassas), 30 Aug. 1862, and in January 1863 received an injury in camp from a falling tree, in consequence of which he was transferred from field service to the command of a camp of instruction at Madison, Fla., in 1864. He remained at that post until the end of the war. Later he became major-general of State troops and a member of the South Carolina legislature (1880–90), where he proposed the South Carolina Election and Registration Law. Among his more important writings may be mentioned 'The History of South Carolina Under the Proprietary Government, 1670–1719' (1897); 'The History of South Carolina Under the Royal Government, 1719–1776' (1899); 'The History of South Carolina in the Revolution, 1775–1780' (1901); and 'The History of South Carolina in the Revolution, 1780–83' (1902).

McCRAE, John David, Canadian physician, soldier and poet: b. Guelph, Ontario, 30 Nov. 1872; d. of pneumonia in France, 28 Jan. 1918. The second son of Lieut.-Col. David McCrae (who organized and took over a battery to France), he was educated at the University of Toronto and took his M.D. degree in 1910. He became Governor's Fellow in Pathology at McGill University; afterwards lecturer in pathology and in medicine. After attaining the M.R.C.P. he was appointed assistant physician to the Royal Victoria Hospital, Montreal, and physician to the Alexandra Hospital. With Professor Adami he was co-author of a textbook on pathology and also contributed to the 'System of Medicine' by Osler and McCrae, the latter being his elder brother (see McCRAE, THOMAS). He served as a lieutenant of artillery in the South African War, taking part in several important engagements. At the outbreak of the European War he volunteered for service and crossed the sea in September 1914 with the Canadian Field Artillery. He served in the field till after the second battle of Ypres, when he was placed in charge of medicine and second in command of the hospital unit provided by McGill University. Shortly before his death he had been appointed consultant to the British Armies in the Field, but had not yet entered upon that post. McCrae attained the rank of lieutenant-colonel; besides achieving high military, professional and academic distinction, he had earned a creditable reputation as a poet. He did not write much, yet his verses have obtained a permanent place in modern anthologies. One of his best-known works is the now famous lyric, 'In Flanders' Fields,' written during the battle of Ypres and originally contributed to *Punch*. The style is peculiarly his own:

In Flanders' Fields the poppies blow
Between the crosses, row on row,
That mark our place, and in the sky
The larks still bravely singing fly,
Scarce heard amidst the guns below.
We are the dead. Short days ago
We lived, felt dawn, saw sunset glow,
Loved and were loved; and now we lie
In Flanders' Fields.

Take up our quarrel with the foe,
To you from falling hands we throw
The Torch — be yours to hold it high;
If you break faith with us who die,
We shall not sleep, though poppies grow,
In Flanders' Fields.

McCRAE, Thomas, American physician: b. Guelph, Ontario, Canada, 16 Dec. 1870. He was educated at the universities of Toronto and Göttingen, and in 1904–12 was associate in medicine at Johns Hopkins Hospital, serving as associate professor of medicine of the university in 1906–12. He has been professor of medicine at Jefferson Medical College, Philadelphia, and physician to the Jefferson and Pennsylvania hospitals since 1912. He was associate editor of Osler's 'System of Medicine'; is co-author, with Sir William Osler, of 'Cancer of the Stomach' (1900); and assistant author of Osler's 'Practice of Medicine' (1912; new ed., 1918).

McCRARY, George Washington, American justice and legislator: b. Evansville, Ind., 29 Aug. 1835; d. Saint Joseph, Mo., 23 June 1890. He went with his family to the Wisconsin Territory, now a part of Iowa, when a year old, studied law in Keokuk, Iowa, and was admitted to the bar in 1856. He was elected to the State legislature in 1857, and in 1861–65 served in the State senate where he was chairman of the committees on military affairs and the judiciary. He was a member of Congress from 1869–77, and was appointed to the committees on naval affairs, revision of laws, elections, railways and canals, and the judiciary. He proposed the formation of a joint committee for the purpose of determining the electoral vote in the Hayes-Tilden Presidential election, and was connected with the preparation and passing of the Electoral Bill. He was Secretary of War under President Hayes in 1877–79, when he was appointed justice of the United States Circuit Court. He resigned in 1884 and removed to Kansas City, Mo., where he acted as general consulting attorney for the Atchison, Topeka and Santa Fé Railroad until his death. He is author of 'American Law of Elections' (1875).

McCREA, Dorothy Frances, Australian poet and story writer. See McCREA, GEORGE GORDON.

McCREA, George Gordon, Australian poet: b. Anchorfield, near Edinburgh, Scotland, 29 May 1833. His father went to Australia in 1841 as warden of the Gold Fields of Australia, taking his family with him. Young McCrea was educated privately and entered the Audit Office in 1854. After serving in the office of the chief secretary and the registrar-general, he became senior examiner of patents and deputy registrar-general. He was retired on a pension after 40 years' service. Among his published works are 'Balladeadro and Mamba' (1866–67); 'Karakorok'; 'The Man in the Iron Mask' (1873); 'A Rosebud from the Garden of Taj,' 'Afloat and Ashore' and a vast amount of material the greater part of which still remains unpublished. Among this are two dramas and 'A History of Seychelles' in two volumes. His son, Hugh Raymond McCrea, is an artist and poet well known in Australia; and his daughter, Dorothy Frances, is a clever story writer and a poet of some reputation in Australia.

McCREA, Hugh Raymond, Australian artist. See McCREA, GEORGE GORDON.

McCREA, mą-krā', Jane, American Revolutionary heroine: b. Bedminster (now Lamington), N. J., 1753; d. near Fort Edward, N. Y., 27 July 1777. She was the daughter of a Scotch Presbyterian clergyman, at whose death she went to live with her brother near Fort Edward, N. Y. At the commencement of the Revolution she was betrothed to David Jones, an officer of the Crown. When Burgoyne's army was advancing from the north she was visiting a Mrs. MacNeil at Fort Edward. Her brother, sharing the general alarm felt throughout the region, sent for his sister, intending to remove to a safer locality. On the morning fixed upon for her departure, a band of Indians in the employ of Burgoyne suddenly swooped down upon the MacNeil household and they, together with Miss McCrea, were made prisoners. Mrs. MacNeil and her party arrived in safety at Burgoyne's camp, but half an hour later another party of Indians arrived, bearing a number of freshly severed scalps, one of which bore the long glossy hair of Miss McCrea, whose body was later found by a roadside. The precise manner of her death never became known. The Indians claimed that she was killed by a random shot from an American detachment, whereupon her captors determined to secure the reward for her scalp. It has been surmised that a quarrel arose among the Indians as to whose captive she was and that one of them in a frenzy tomahawked her. Other authorities credit the story that Lieutenant Jones hired the Indians to bring his betrothed to camp where they were to be married and that she was killed in a controversy which arose as to whose captive she was. Lieutenant Jones denied this story; he lived to an old age, a morose and gloomy man. At all events the tragedy caused a general feeling of horror throughout America and England. Burgoyne called a council of his Indian chiefs in order to reprove them, but as his allies would have deserted him the offender was allowed to go unpunished. A blasted pine long marked the spot where tradition relates the beautiful young girl was murdered, and her grave may be seen in a small cemetery near the ruins of Fort Edward. Consult Bascom, R. O., 'The Fort Edward Book' (Fort Edward 1903), and Wilson, D., 'The Life of Jane McCrea' (New York 1853).

McCREARY, mą-krē'ri, James Bennett, American lawyer: b. Madison County, Ky., 8 July 1838. He was graduated at Centre College, Danville, Ky., in 1857, and from the Law School of Cumberland University, Tennessee, 1859. He entered the Confederate army in 1862 as major of cavalry and served until close of war, being then lieutenant-colonel of the 11th Kentucky Cavalry, C. S. A. He was a member of the Kentucky house of representatives in 1869, 1871 and 1873 (being Speaker 1871–73); governor of Kentucky 1875–79, and a member of Congress in 1885–97. He was a delegate to the International Monetary Conference at Brussels, Belgium, in 1891, and in 1903 became United States senator. In 1911–15 he was again governor of Kentucky. He was delegate-at-large to the Kansas City National Democratic Convention and to the Baltimore Convention of 1912.

McCREERY, James, American merchant: b. Ireland; d. Aiken, S. C., 1893. He came to the United States when about 20 and engaged in the dry goods business in Baltimore, and at the beginning of the Civil War removed to New

York, where he soon established a business of his own which made him ultimately one of New York's leading merchants. He was a member of many public boards, one of the founders of the silk industry in America and director of numerous commercial enterprises. He was one of the Chamber of Commerce delegation sent to England two years before his death, and was a leading member of various clubs, chiefly of an educational or public character.

McCULLOCH, mą-kŭl'ō, **Benjamin,** American soldier: b. Rutherford County, Tenn., 11 Nov. 1811; d. 7 March 1862. He became a skilled hunter and boatman and joined other frontiersmen in settling Texas. In 1835 he served in the Texan war for independence, being in the battle of San Jacinto. Later he settled as surveyor at Gonzales and was elected to the Texas Congress in 1839. In the following year he was engaged in fighting the Comanches and operating against Mexican raiders. He also commanded a company of rangers in the Mexican War under Taylor and Scott, did important work as a scout, and was specially distinguished at the battles of Monterey and Buena Vista, and in the siege of the City of Mexico. In 1853 he was appointed United States marshal in Texas. In 1857 he was one of the commissioners appointed to settle the Mormon difficulties in Utah. During the Civil War he served in the Confederate army, was appointed brigadier-general and sent into Missouri, where he was defeated at the battle of Dug Spring, but later united his forces with those of General Price and then defeated the Federals under General Lyon (q.v.) at Wilson's Creek. He commanded a corps at the battle of Pea Ridge, Ark., where he was killed by a sharpshooter while making a reconnaissance. Consult Reid, S. C., 'Scouting Expeditions of McCulloch's Rangers' (Philadelphia 1859).

McCULLOCH, mą-kŭl'ŏh, **Hugh,** American financier: b. Kennebunk, Me., 7 Dec. 1808; d. near Washington, D. C., 24 May 1895. He was educated at Bowdoin College and went in 1833 to Fort Wayne, Ind., where he established a law practice which he continued until 1835 when he entered a branch of the State Bank of Indiana. He was chosen director in 1836 and in 1857 became president of the newly incorporated State Bank of Indiana. He was appointed Comptroller of the Currency in 1863 and in 1865 became Secretary of the Treasury under President Lincoln. Owing to the enormous expenses incurred by the Civil War, the finances of the country were in a critical condition; in six months the large sum due 500,000 soldiers and sailors was paid together with other heavy expenses, and a reduction of the national debt was begun. McCulloch converted more than $1,000,000,000 of short-time obligations into a funded debt, and in less than two years had succeeded in putting the finances of the country on a sound basis. Congress approved his course and his plan for a speedy resumption of specie payment, but he met with opposition in his purpose to retire the legal-tender notes. He occupied the office until 1869 and in 1871 opened a banking business in London where he remained until 1878. He was reappointed to the Secretaryship of the Treasury by President Arthur in 1884 and continued in office until the close of the administration. He wrote 'Men and Measures of Half a Century,' and many of his speeches together with a large share of his correspondence have been published. He was the last living member of Lincoln's distinguished cabinet.

McCULLOCH, John Ramsay, English political economist: b. Whithorn, Wigtownshire, 1 March 1789; d. London, England, 11 Nov. 1864. He was educated at Edinburgh; became editor of *The Scotsman,* an Edinburgh newspaper, 1818–20, and from 1818 wrote many articles for the *Edinburgh Review.* He was professor of political economy in London University, 1828–32, and in 1838 was appointed comptroller of the stationery office. Among his many books may be mentioned 'The Principles of Political Economy' (1825); 'Historical Sketch of the Bank of England' (1831); 'Dictionary of Commerce' (1832); 'Geographical Dictionary' (1841); 'A Treatise on the Principles and Practical Influence of Taxation and the Funding System' (1845); 'The Literature of Political Economy' (1845), etc. He was one of the earliest advocates of free-trade in Great Britain.

MacCULLOUGH, mą-kŭl'ōk, **John Edward,** American tragedian: b. Coleraine, Ireland, 2 Nov. 1837; d. Philadelphia, 8 Nov. 1885. He came to the United States in 1853, studied for the stage and made his début in Philadelphia, 1857. He played with Edwin Forrest, who left him at his death all his manuscript plays. In 1869 he managed, with Lawrence Barrett, the Bush Street Theatre in San Francisco, Cal. His appearance in England in 1881 was not successful, but his popularity in America remained unbroken. Despite his lack of literary education, a serious handicap, he won high rank in his profession. He played De Mauprat to Edwin Booth's Richelieu, and Richmond to his Richard III. His interpretation of Virginius was unexcelled during his day. Among his leading rôles were Hamlet, Macduff, Richelieu, Spartacus, etc. In 1884, at the height of his brilliant career, he suddenly collapsed, both physically and mentally; he died a year later in an insane asylum in Philadelphia. Consult Clark, 'John McCullough as Man, Actor, and Spirit' (Boston 1905).

McCULLOUGH, John Griffith, American politician: b. Welsh Tract, near Newark, Del., 16 Sept. 1835; d. 29 May 1915. He was graduated from Delaware College in 1855 and from the law department of the University of Pennsylvania in 1858. He removed to California in 1859, engaged in law practice in Mariposa County, was elected to the State legislature in 1861, to the senate in 1862 and in 1863–67 was attorney-general. In 1867–73 he practised law in San Francisco and then removed to Bennington, Vt., where he became director and president of several railway systems and prominently connected with various banking and commercial enterprises. He was elected to the Vermont senate in 1898 and in 1902 was elected governor of the State.

McCUMBER, m'kŭm'bėr, **Porter James,** American legislator: b. Crete, Will County, Ill., 3 Feb. 1858. He was graduated at the University of Michigan in 1880 and engaged in the practice of law. He has been senior mem-

ber of the law firm of McCumber and Bogart at Wahpeton, N. Dak., since 1881. He served in the Territorial house of representatives in 1885–89; was state's attorney, Richland County, in 1896–97; and in 1899 took his seat in the United States Senate where he was re-elected three times, his present term expiring in 1923.

MacCUNN, mą-kŭn', **Hamish,** Scottish composer: b. Greenock, Scotland, 22 March 1868. He was educated in Greenock and at the Royal College of Music, London, made his début in the musical world in 1887, and in 1888 became a junior professor of harmony in the Royal Academy of Music, which position he resigned in 1894. As a composer he has attained high rank; his productions are rich in melody, and his command of the orchestra is remarkable. His work is typically Scottish in character and in choice of subject. Among the more important of his numerous works are overtures, etc., 'The Land of the Mountain and the Flood'; 'Chior Mhor'; 'The Dowie Dens o' Yarrow'; 'The Ship o' the Fiend'; dramatic cantatas, 'Lord Ullin's Daughter'; 'Bonny Kilmeny'; 'Lay of the Last Minstrel,' and the operas, 'Jeannie Deans' and 'Diarmid.'

MacCURDY, George Grant, American anthropologist: b. Warrensburg, Mo., 17 April 1863. He was graduated at the State Normal School at Warrensburg in 1887, at Harvard in 1893 and subsequently studied at the universities of Vienna, Paris and Berlin. He was instructor in anthropology at Yale in 1898–1900, and was later lecturer and curator of anthropological collections there, becoming assistant professor of prehistoric archæology in 1910. Author of 'The Eolithic Problem' (1905); 'Antiquity of Man in Europe' (1910); 'A Study of Chiráquian Antiquities' (1911).

McCURDY, mą-kėr'dĭ, **James Frederick,** Canadian Orientalist: b. Chatham, N. B., 18 Feb. 1847. He was educated at the University of New Brunswick, Princeton Theological Seminary and in Germany. He was assistant professor in Oriental languages at Princeton, 1873–82; and Stone lecturer there in 1885–86. In 1886 he was appointed lecturer in University College of Toronto, and from 1888–1914 was professor of Oriental languages in that college. Among his works are 'Aryo-Semitic Speech' (1881); 'History, Prophecy and the Monuments' (3 vols., 1894–1901); 'Life and Work of D. J. Macdonnell' (1897); an original commentary on Haggai, and various translations for the American edition of 'Lange's Commentary,' etc.

McCURDY, Richard Aldrich, American capitalist: b. New York City, 29 Jan. 1835; d. Morristown, N. J., 6 March 1916. He was graduated at Harvard University in 1856, and engaged in the practice of law in New York. He became attorney for the Mutual Life Insurance Company in 1860, vice-president in 1865 and was president in 1885–1906. The investigation of his company in 1905 revealed mismanagement and gross extravagance, particularly in the matter of salaries for the officials. He resigned and retired in 1906.

McCUTCHEON, mă-kŭch'ŭn, **George Barr,** American novelist: b. near Lafayette, Ind., 26 July 1866. He was educated at private schools and at Purdue University. After leaving college, before graduation, he became a reporter on the Lafayette *Morning Journal,* at a salary of $6 a week. Prior to that time he had written a series of dialect letters for the *Sunday Leader,* of Lafayette, under the caption 'Waddleton Mail,' published in that paper in 1890. After three years on the *Journal,* he became city editor of the Lafayette *Daily Courier,* serving in that capacity until June 1902, when newspaper work was abandoned for novel-writing alone. While with the *Courier,* he contributed to that newspaper a serial story entitled 'The Wired End,' which has never been published in book form; and also contributed short stories to various magazines during these years. He went to Chicago to reside in 1902, and in July 1910 removed to New York City.

His novels include 'Graustark' (1901), dramatised; 'Castle Craneycrow' (1902); 'Brewster's Millions' (1903), dramatised; 'The Sherrods' (1903); 'The Day of the Dog' (1904), novelette; 'Beverly of Graustark' (1904), dramatised; 'The Purple Parasol' (1905), novelette; 'Nedra' (1905); 'Cowardice Court' (1906), novelette; 'Jane Cable' (1906); 'The Flyers' (1906), dramatised, novelette; 'The Daughter of Anderson Crow' (1907); 'The Husbands of Edith' (1908), novelette, dramatised; 'The Man From Brodney's' (1908); 'The Alternative' (1909), novelette; 'Truxton King' (1909), dramatised; 'The Butterfly Man' (1910), novelette; 'The Rose in the Ring' (1910); 'What's-His-Name' (1911), novelette; 'Mary Midthorne' (1911); 'Her Weight in Gold' (1912), novelette; 'The Hollow of Her Hand' (1912); 'A Fool and His Money' (1913); 'Black is White' (1914); 'The Prince of Graustark' (1914); 'Mr. Bingle' (1915).

McCUTCHEON, John Tinney, American cartoonist: b. near South Raub, Ind., 6 May 1870. He is a brother of G. B. McCutcheon (q.v.). He was graduated from Purdue University in 1889 and has been connected with the leading newspapers of Chicago since 1889, his work as a cartoonist becoming famous in the campaign of 1896. He started around the world on dispatch boat *McCulloch* in January 1898; was on board that vessel, during the war with Spain, in battle of Manila Bay 1898. In 1899 he made a tour of special service in India, Burma, Siam and Cochin China and later in northern China, Korea and Japan, returning to the Philippines during the fall campaign there. He followed the various campaigns on the islands until April 1899 when he was sent to the Transvaal. He joined the Boers in the interest of his paper and furnished political cartoons for the Chicago *Record* during the campaign of 1900. In 1909–10 he visited Africa, the while contributing articles and cartoons for the Chicago *Sunday Tribune.* He went to Mexico as special correspondent in 1914; was with the Belgian and German armies in the autumn of the same year, and in France, Saloniki and the Balkans in 1915–16. He has published 'Stories of Filipino Warfare' (1900); 'Cartoons by McCutcheon' (1903); 'Bird Centre Cartoons' (1904); 'The Mysterious Stranger and Other Cartoons' (1905); 'Congressman Pumphrey the People's Friend' (1907); 'In Africa' (1910); 'T. R. in

Cartoons' (1910); 'Dawson II — Fortune Hunter' (1912).

McDANIEL, Henry Dickerson, American lawyer: b. Monroe, Ga., 4 Sept. 1836. He was graduated from Mercer University, Macon, Ga., 1856, and admitted to the bar in 1857. He attended as delegate the Georgia Secession Convention in 1861; and served in the Confederate army until the end of the war, attaining the rank of major in the 11th Georgia Infantry. In 1865 he was a member of the Georgia Constitutional Convention. His disability to hold office having been removed in 1872 by the United States Congress, he served in the State legislature, 1873–74; was State senator, 1874–83, and in 1883 he was elected governor of Georgia, which office he occupied for three years. He has been trustee of the University of Georgia since 1884, and chairman of the board since 1899. He is also director in several industrial enterprises.

McDANIEL, Walton Brooks, American philologist and educator: b. Cambridge, Mass., 4 March 1871. He was graduated at Harvard in 1893. He was assistant in Latin and Greek at Harvard in 1896–97, instructor there and at Radcliffe College in 1899–1901, and from 1909 was professor of Latin at the University of Pennsylvania. He is associate editor of *Classical Weekly,* and author of numerous magazine articles on philological subjects.

McDONALD, Andrew Archibald, Canadian statesman: b. Three Rivers, Prince Edward Island, 14 Feb. 1829; d. 21 March 1912. He entered public life in 1853 as member of the Island assembly, serving until 1858, and again in 1863–74. He was a delegate to the Quebec Conference on the Union of the Provinces in 1864; and in 1873 became provincial postmaster-general, also serving as acting post-office inspector until 1884. In 1884–89 he was lieutenant-governor of the province, and from 1891 he was a member of the Dominion Senate.

McDONALD, Arthur, American criminologist and author: b. Caledonia, N. Y., 4 July 1856. He was educated at the University of Rochester, the Princeton and Union Theological seminaries, and later studied medicine at Berlin, Leipzig, Paris, Zürich and Vienna. He was connected with the United States Bureau of Education in 1892–1904 as a specialist in possibilities of education for the abnormal and weakling classes. He represented the United States at three International Psychological and Criminalogical Congresses, and was honorary president of the Congress of Criminal Anthropology in Europe. He made a special study of American and European prisons and asylums for the insane and for inebriates, and of slums for the United States Bureau of Education. Author of 'Abnormal Man' (1893); 'Education and Patho-Social Studies' (1896); 'Statistics and Crime, Suicide and Insanity' (1903); 'Juvenile Crime and Reformation' (1908); 'Mentality of Nations and Social Pathology' (1912).

MacDONALD, Charles, American civil engineer and bridge-builder: b. Gananoque, Ontario, Canada, 26 Jan. 1837. He studied at the preparatory school at Queen's University, Kingston, engaged in surveying on the Grand Trunk Railway and later entered the Rensselaer Polytechnic Institute, Troy, N. Y., where he was graduated in 1857. He returned to railroad work after graduation and upon the completion of the Grand Trunk Railway's extension from Sarnia, Ontario, to Detroit, Mich., in 1863, he was engaged by the Philadelphia and Reading Railroad. He was for a short time engaged with the Union army on the threatened invasion of Pennsylvania, and was taken prisoner; but was held for only a brief period. In 1868 he definitely turned his attention to bridge-building, forming a partnership with A. B. Burton. The firm constructed the bridges between Hoboken and Dover, N. J., on the Boonton branch of the Delaware and Lackawanna Railroad, and in 1872 MacDonald designed and constructed Point Bridge at Providence, R. I., which has a 250-foot draw span. He was senior partner of the Union Bridge Company which constructed the Hawksburg Bridge, Australia; the Leavenworth Bridge, Kansas; the Poughkeepsie Bridge over the Hudson; and the Merchant's Bridge, Saint Louis. He is a trustee of the Rensselaer Polytechnic Institute and in 1908–09 he was president of the American Society of Civil Engineers.

MacDONALD, Duncan Black, American philologist: b. Glasgow, Scotland, 9 April 1863. He was graduated at the University of Glasgow in 1885 and later studied at the University of Berlin. He came to the United States in 1892 and has since been professor of Semitic languages at the Hartford Theological Seminary. He was Haskell lecturer on comparative religion at the University of Chicago in 1906; special lecturer at Wellesley College in 1907, 1909, and at the Episcopal Theological School, Cambridge, in 1912. He is head of the Mohammedan department at the Kennedy School of Missions, Hartford, and in 1914 was Haskell lecturer at Oberlin College. He was lecturer at the O. T. Berkeley Divinity School in 1917–18. He discovered in the Bodleian Library the only known Oriental manuscript of 'Ali Baba and the Forty Thieves' which he published in the *Journal* of the Royal Asiatic Society of Great Britain, of which society he is a member. He contributed to the 'Encyclopedia Britannica,' the 'Encyclopedia of Islam' and is author of 'The Development of Muslim Theology' (1903); 'Selections from Ibu Kaldun' (1905); 'Aspects of Islam' (1911).

MACDONALD, Etienne Jacques Joseph Alexandre, ā-tē-ĕn zhăk zhō-zef ăl-ĕks-ăndr măk dŏ-năl, Duc de Tarente, French soldier: b. Sancerre, France, 17 Nov. 1765; d. Courcelles, France, 24 Sept. 1840. He served in the French Revolution as colonel, brigadier-general and general, and in 1798 was made governor of the Roman states, and of Naples in 1799. In 1805 he lost the favor of Napoleon, but four years later was given command of the right wing of the army in Italy, and was made a marshal for his services at Wagram 6 July 1809. He served in Spain and in the Russian campaign, assisted in covering the retreat from Leipzig, advised Napoleon's abdication, was made a peer by the Bourbons and during the Hundred Days supported them.

MacDONALD, Flora, Scottish heroine: b. Milton, island of South Uist, Hebrides, 1720; d. there, 4 March 1790. She was brought up

by the chief of her clan, MacDonald of Clanranald, her father having died in her early childhood, and was partly educated in Edinburgh. After the battle of Culloden, in 1746, her assistance was sought in securing the escape of Prince Charles Edward who had taken refuge at Benbecula where Flora MacDonald was then living. The Prince was disguised as a woman servant and the party succeeded in reaching Skye in safety. Flora's assistance to the Prince became known, however, and she was imprisoned in the Tower of London, but was soon afterward permitted to live outside the prison, although under charge of a gaoler. The Indemnity Act of 1747 secured her complete liberty. She was married to Allan MacDonald in 1750, and in 1774 they emigrated to America, settling in Fayetteville, N. C. Her husband served in the British army in the Revolutionary War and was taken prisoner. Flora returned alone to Scotland and was later rejoined by her husband. She was a woman of great beauty and charm of manner, Dr. Johnson, among others, being warm in her praises. Five of her sons served in the British army or navy. Consult 'Life and Times of Prince Charles Edward' (1886); Yonge, C. D., 'Seven Heroines of Christendom' (1879); Macgregor, 'Flora MacDonald and Her Adventures with Prince Charles' (1882).

MACDONALD, George, Scottish poet and novelist: b. Huntly, Aberdeenshire, 10 Dec. 1824; d. Ashtead, Surrey, 18 Sept. 1905. He was educated at Aberdeen University and at King's College, London, and entered the Independent ministry, from which he afterward retired and became a lay member of the English Church. Macdonald's work comprises poetry, novels, religious and juvenile books and is marked by deep religious feeling and devotion to lofty ideals of life. His novels deal chiefly with Scottish character and scenery, in which they hold the place of classics. The best known of his many books are 'David Elginbrod' (1862); 'Alec Forbes of Howglen' (1865); 'Annals of a Quiet Neighborhood' (1866); 'Robert Falconer,' his best work (1868); 'The Miracles of Our Lord' (1870); 'Malcolm' (1875); 'The Marquis of Lossie' (1877); 'Sir Gibbie' (1879); 'Castle Warlock' (1882).

MACDONALD, Sir Hector, British general: b. Urquhart, Scotland, 13 April 1853; d. Paris, France, 25 March 1903. In 1870 he enlisted and served in the ranks nine years. He first saw active service in the Second Afghan War in 1879, was with Sir F. Roberts in the march from Candahar to Cabul, and for brilliant service was made 2d lieutenant. He served in the Boer War of 1881 and was captured at Majuba Hill. He was conspicuous in the Suakim campaign of 1888–91; was at the capture of Tokar in 1891; in 1896 commanded a brigade in the Dongola campaign; served in the Nile expedition of 1897–98, and by his adroit handling of his troops at the battle of Omduram turned what might have proved disaster into victory. In 1899 he held the rank of brigadier-general in India, and after the battle of Magersfontein succeeded to the command of the Highland Brigade. He was made K.C.B. and in 1902 was placed in command at Ceylon, but the following year while traveling back to England to answer a charge, subsequently found to be false, he committed suicide in Paris. He was popularly known as "Fighting Mac," and a tower 100 feet high at Dingwall, since 1907, commemorates his brilliant career. Consult Coates, T. F. G., 'Hector Macdonald' (London 1900).

MacDONALD, Sir Hugh John, Canadian statesman, son of Sir John A. MacDonald (q.v.): b. Middlesex County, Ontario, 13 March 1850. He was educated at Queen's College and at the University of Toronto, became a barrister in 1872, practising in Toronto until 1882, when he removed to Winnipeg. He was a member of the Canadian House of Commons in 1891–93 and in 1896–97, and in 1896 was Minister of the Interior. He was Premier and Attorney-General of Manitoba in 1900. Since 1911 he has been police magistrate of the city of Winnipeg and he has also served as Commissioner and Commissioner of Railways in Manitoba. He served in the Fenian Raid of 1866; the Red River Expedition of 1870; and in the Northwest Rebellion he was captain of the 19th Regiment. He was knighted in 1913.

MacDONALD, Hunter, American civil engineer: b. Winchester, Va., 12 June 1860. He studied at the Washington and Lee University and in 1879 became assistant engineer for the Louisville and Nashville Railroad. Later in 1879 he became connected with the Nashville, Chattanooga and Saint Louis Railroad, and in 1891–92 he was resident engineer for the Western and Atlantic Railroad at Atlanta, Ga. Since 1892 he has been chief engineer of the Nashville, Chattanooga and Saint Louis Railroad. He was president of the American Railroad Engineering Association in 1904–05 and of the American Society of Civil Engineers in 1914.

McDONALD, James, American physician: b. White Plains, N. Y., 18 July 1803; d. Flushing, L. I., 5 May 1849. He was graduated at the College of Physicians and Surgeons, New York, in 1825, and was appointed resident physician at Bloomingdale Asylum, where he remained until 1837 with the exception of a year's absence in 1831 when he was sent by the New York hospital governors to visit insane asylums in Europe. He was appointed visiting physician to the New York Hospital in 1837, and in 1841 he established a private insane asylum at Murray Hill, subsequently removing it to Flushing, L. I. He began in 1842 his lectures on mental diseases at the College of Physicians and Surgeons, the first to be delivered in the United States. Author of 'Reports on the Condition of Blackwell's Island' (1835); 'Construction and Management of Insane Hospitals' (1837); 'Puerperal Insanity' (1845).

McDONALD, James, Canadian statesman and jurist: b. East River, Nova Scotia, 1 July 1828; d. 1912. He was educated at New Glasgow, was admitted to the bar in 1851 and became queen's counsel in 1867. He served in the legislature of Nova Scotia in 1859–67 and in 1871–72, when he resigned; and was a member of the Canadian Parliament in 1874–81. He was chief railway commissioner for Nova Scotia in 1863–64, and financial secretary from 1864 until the union. He was Minister of Justice of Nova Scotia in 1878–81, and chief justice in 1881–1904, when he was retired. He was

a member of the commission appointed to facilitate trade relations between Canada and Central and South America in 1865–66.

McDONALD, James Alexander, Canadian jurist: b. 1858, Huron County, Ontario. He was educated at the University of Toronto, became a barrister in 1890 and king's counsel in 1906. He engaged in practice in Toronto until 1896 when he removed to Rossland, B. C., where he practised until 1909. He was a member of the Rossland legislature in 1903–09, when he resigned to become chief justice of the Court of Appeals, British Columbia.

McDONALD, James Alexander, Canadian clergyman and journalist: b. Middlesex County, Ontario, 22 Jan. 1862. He studied at Hamilton College and the universities of Toronto and Edinburgh, and was graduated from Knox College, Toronto, in 1887. He was ordained a minister in the Presbyterian Church in 1881 and became pastor of Knox Church, Saint Thomas, Ontario. He resigned in 1896 to become the first editor of the *Westminster,* a religious monthly. He afterward edited the *Presbyterian;* and in 1902–16 he was managing editor of the *Globe.* He was a delegate to the Imperial Press Conference, London, England, in 1909, one of the founders of the Canadian Author's Club in 1899, and has been a member of the board of governors of the University of Toronto since 1906. Author of 'The Significance of Lincoln'; 'What a Newspaper Man Saw in Britain' (1911); 'Democracy and the Nations,' etc.

McDONALD, James Ramsay, British politician: b. Lossiemouth, Scotland, 1866. He early entered politics, became secretary of the Labor party in 1900–11, and in 1906–09 was president of the Independent Labor party. He was the leader of the Labor party in 1911–14. In 1901–04 he was a member of the London county council. Author of 'Socialism and Society' (1905); 'Socialism and Government' (1909); 'The Social Unrest' (1913); 'National Defence.'

MacDONALD, James Wilson Alexander, American sculptor: b. Steubenville, Ohio, 25 Aug. 1824; d. 14 Aug. 1908. He studied under Waugh in Saint Louis and in New York in 1849. Among his numerous works are statues of 'Joan of Arc'; 'Italia'; Edward Bates (1876) in Forest Park, Saint Louis; General Custer, at West Point; Fitz-Greene Halleck in Central Park, New York; an equestrian statue of Gen. Nathaniel Lyon; numerous busts, including that of Washington, in Prospect Park, Brooklyn, and those of Bryant, Cooper and Weed. He owned Houdon's original model, and from it prepared several busts of Washington. He also painted portraits and landscapes and lectured on art, etc.

MACDONALD, Sir John Alexander, Canadian statesman: b. Glasgow, Scotland, 11 Jan. 1815; d. Ottawa, Ontario, 6 June 1891. In early youth he emigrated with his father to Canada. At 21 he was a practising barrister at Kingston, Upper Canada, and in 1844 he was elected to the Canadian Parliament for that constituency. While repudiating the name of Tory, throughout his career Macdonald was the most conspicuous figure in the Conservative party in Canada. He became a cabinet minister in 1847, and, after various vicissitudes of his party, Prime Minister in 1857. Macdonald's most important work is connected with the federation of Canada. The French and the English provinces, previously independent, had been united under one Parliament in 1841, and during the next 25 years each party had both an English and a French leader. Ministries changed rapidly, and in 1864 there was a deadlock. This made necessary some wider union; and in that year a conference of delegates met at Quebec to consider the federation of British North America. Directed largely by Macdonald's tact and resource this conference led to the establishment of the Dominion of Canada in 1867, under the British North America Act, passed by the British Parliament. Macdonald became the first Prime Minister of the Dominion. At first there were only four provinces, but he carried through successfully the negotiations by which the Hudson Bay company ceded its interests in the northwest to Canada; he secured also the entrance of British Columbia on the condition of building rapidly a transcontinental railway. During an election in 1872 Macdonald accepted large sums for party purposes from Sir Hugh Allan, one of the chief projectors of the Pacific railway, and in 1873 owing to this "Pacific Scandal" he was forced to retire from office. In 1878 he again became Prime Minister with a policy of protection and he may be regarded as the father of that system in Canada. He remained Prime Minister until his death in 1891. The confederation of Canada, the acquisition by Canada of the Northwest, the building of the Intercolonial and the Canadian Pacific railways, and the policy of protection were all effected under Macdonald's lead. His brilliant intellect and ready wit made him a really great leader. In 1867 he was created K.C.B., in 1884 G.C.B., and on his death his widow was created Baroness Macdonald in her own right. Consult Pope's 'Memoirs of Sir John A. Macdonald' (1894); Parkin, 'Sir John A. Macdonald' in 'Makers of Canada' (1908).

GEORGE M. WRONG,
Professor of History, University of Toronto.

McDONALD, John Bartholomew, American engineer and contractor: b. Ireland, 7 Nov. 1844; d. 17 March 1911. He was brought to the United States in 1847, and received his education in the public schools of New York. Among his successful undertakings may be mentioned the Fourth avenue improvement for sinking the New York Central Railroad tracks in New York City from 42d street to Harlem; West Shore Railroad from Weehawken to Buffalo; Baltimore and Ohio Railroad from Baltimore to Philadelphia; Illinois Central Railroad from Elgin, Ill., to Dolgeville, Wis.; the Georgian Bay branch of the Canadian Pacific Railroad; the Trenton "cut-off" of the Pennsylvania Railroad; the Baltimore Belt Railroad, which carried the great Baltimore and Ohio Railroad under the city of Baltimore, etc. He constructed the Jerome Park reservoir, New York City, the largest artificial storage reservoir in the world. His greatest contract was for the construction, equipment, operation and maintenance of the Rapid Transit Railroad (the "Subway") in New York City.

MACDONALD, John Sandfield, Canadian statesman: b. Saint Raphael's, Canada, 12 Dec.

1812; d. Cornwall, Ontario, 1 June 1872. He was self-educated and admitted to the bar in 1840, practising successfully in Cornwall. In 1841 he was elected to the Canadian Parliament as member from Cornwall. Macdonald was solicitor-general in 1849–51; 1852–54 was speaker of Parliament; Attorney-General in the brief Brown-Dorion administration in 1858, and Premier in 1862–64. He was the first Premier of the province of Ontario, 1867–71.

McDONALD, Joseph Ewing, American lawyer: b. Butler County, Ohio, 29 Aug. 1819; d. Indianapolis, Ind., 21 June 1891. He was educated at Ashbury (now De Pauw) University; studied law and was admitted to the bar in 1844, and established a practice in Crawfordsville, where he was county prosecuting attorney, 1845–47. In 1848 he was member of Congress and from 1856–60 attorney-general of Indiana. He then practised law in Indianapolis and in 1864 was an unsuccessful candidate for governor being defeated by Oliver P. Morton. In 1872 he was chairman of the Democratic State Committee and in 1875 was elected to the United States Senate, serving until 1881, when he returned to Indianapolis where he resumed the practice of law.

MacDONALD, William, American educator and historian: b. Providence, R. I., 31 July 1863. He was graduated at Harvard in 1892, and in 1892–93 was professor of history and economics at Worcester Polytechnic Institute. He was professor of history and political science at Bowdoin in 1893–1901 and since 1901 has been professor of history at Brown University. He edited 'Select Documents Illustrative of the History of the United States' (1898); 'Johnston's High School History of the United States' (1901); 'Documentary Source Book of American History' (1908); Parkman's 'Oregon Trail' (1911). Author of 'History and Government of Maine' (1902); 'Jacksonian Democracy' (1905); 'From Jefferson to Lincoln' (1913).

MacDONALD, Sir William Christopher, Canadian capitalist and philanthropist: b. Glenaladale, Prince Edward Island, 1831; d. Montreal, 11 June 1917. He early engaged in business in Montreal and achieved a large financial success as importer. merchant and tobacco manufacturer. He was a director of the Bank of Montreal, a governor of McGill University and of the Montreal General Hospital, and also served as president of the Legislative Council of Prince Edward Island. His gifts to McGill University and the MacDonald Agricultural College connected with it amounted to more than $12,500,000. He also made large gifts to the normal school at Sainte-Anne de Bellevue, province of Quebec, the Ontario Agricultural College and to different hospitals. He was knighted in 1898.

McDONALD, Pa., borough of Washington County, 18 miles southwest of Pittsburgh, on the Pittsburgh, Cincinnati, Chicago and Saint Louis Railroad. It is situated in a coal and oil district and there are flour mills, bottle works and tool factories. Pop. about 2,543.

MACDONELL, măk-dŏn'ĕl, **Alexander,** Canadian Roman Catholic prelate: b. Inverness-shire, Scotland, 7 July 1762; d. Dumfries, Scotland, 14 Jan. 1840. He was educated at the Scots College, Spain, entered the priesthood in 1787, and was for several years a missionary. He assisted in the organization of the Glengarry Fencibles and was their chaplain and in 1803 established for its disbanded members a colony in Glengarry County, Ontario, Canada. He also assisted in raising the Canadian regiment of Glengarry Fencibles, which was actively engaged in repelling the American invaders in the War of 1812–14. In 1819 he was made vicar apostolic of Upper Canada and through his influence 48 parishes were established in Upper Canada. He was the first Roman Catholic bishop in Upper Canada, being consecrated bishop of Kingston, 14 Feb. 1826. He was called to the Legislative Council in 1831. He died in Scotland while on a mission to obtain funds for the founding of Regiopolis College, Kingston, and is buried in his episcopal city.

MacDONELL, Arthur Anthony, English philologist: b. Lochgarry, 11 May 1854. He was educated at Göttingen and at Corpus Christi College, Oxford. He was Taylorian teacher of German at Oxford in 1880–99 and professor of Sanskrit in 1888–99, since when he has been Boden professor of Sanskrit there. He made a tour of study and research in India in 1907–08, and in 1914 received the Campbell Memorial Gold Medal for Oriental Research from the Royal Asiatic Society of Bombay. He is keeper of the Indian Institute; and a Fellow of Balliol College and of the Royal Danish Academy. Author of 'Sanskrit-English Dictionary' (1892); 'A History of Sanskrit Literature' (1900); 'The Brhaddevatā' translated and critically edited (2 vols., 1904); 'Vedic Grammar' (1910); 'A Vedic Grammar for Students' (1916).

MacDONELL, Daniel James, Canadian clergyman: b. Bathurst, New Brunswick, 15 Jan. 1843; d. 1896. He was graduated at Queen's College, Kingston, in 1858 and later studied at Glasgow, Heidelberg and Edinburgh universities. He was ordained in the Presbyterian ministry, at Edinburgh, in 1866, returned to Canada and served as minister of Saint Andrew's Church, Peterborough, until 1870, when he removed to Toronto to take charge of the imposing new Saint Andrew's Church which had been built for him there. His expression of doubt in regard to certain doctrines of the Church, particularly that of eternal punishment, led to his being tried for heresy. While not subscribing to a personal belief in the doctrines upon which he had expressed doubts he formally endorsed them and agreed not to discuss them in the pulpit. His influence generally was regarded as having contributed appreciably to a broader trend of thought in the Church. He took an active part in bringing about the union of the different branches of the Presbyterian Church in Canada, which was effected in 1875. He was noted for his sound learning and for his eloquence. He was one of the editors of the 'Canadian Presbyterian Hymnal' (1878–81).

MacDONNELL, Anthony Patrick, 1st Baron, British administrator: b. 17 March 1844. He was educated at Queen's College, Galway, and entered the Indian Civil Service in 1865. He was appointed acting chief commissioner of Burmah in 1889, chief commissioner of the

Central Provinces in 1891, acting lieutenant-governor of Bengal in 1893, and served on the council of the viceroy of India in 1893–95. He was lieutenant-governor of the Northwestern Provinces and chief commissioner of Oudh in 1895–1901, was a member of the Council of India in 1902, and Under Sectretary of State in Ireland in 1902–08. He was created a baron in 1908.

McDONNELL, Charles Edward, American Roman Catholic prelate: b. New York, N. Y., 1 Feb. 1854. He studied at the De La Salle Institute and Saint Francis Xavier's College in that city, but finished his theological course at the American College, Rome, Italy. While there he received the degree of D.D., and was ordained priest by Bishop Chatard 18 May 1878. Returning to America the same year, he was appointed assistant at Saint Mary's Church, New York City, and in 1879 was transferred to Saint Patrick's Cathedral. On the death of Bishop Loughlin, Dr. McDonnell, who, at the time was Archbishop Corrigan's secretary, was named bishop of Brooklyn, being consecrated by Archbishop Corrigan 25 April 1892. At his invitation the Benedictine Fathers have come from the Bahama Islands to establish themselves in his diocese, and the Redemptorists also have made a foundation in Brooklyn. On the passage of the French law separating Church and State, Dr. McDonnell invited a number of French communities of men and of women to take up their residence in his diocese. He is spiritual adviser of the Catholic Benevolent Legion, and also honorary president of the International Catholic Truth Society.

McDONOGH, măk-dŏn'ō, **John,** American philanthropist: b. Baltimore, Md., 29 Sept. 1779; d. McDonogh, La., 26 Oct. 1850. He was educated at an academy in Baltimore and entered the mercantile business there, removing in 1800 to New Orleans, where he rapidly acquired great wealth. He was deeply interested in the problem of slavery and devised a system through which his slaves were enabled to earn their freedom; he educated those among them who desired it, and sent to Africa shiploads of those who had earned their freedom. He was president of the American Colonization Society and was a generous contributor to its support. The bulk of his fortune of more than $2,000,000 he bequeathed to the cities of New Orleans and Baltimore for the establishment of free schools. The will was adjudged valid after years of litigation and Baltimore established the McDonogh schools while New Orleans invested its portion of the bequest in its public schools.

MACDONOUGH, măk-dŏn'ō, **Thomas,** American naval officer: b. Newcastle County, Del., 23 Dec. 1783; d. at sea, 18 Nov. 1825. He entered the navy as midshipman in 1800 and in 1803 was attached to the frigate *Philadelphia,* one of the squadron employed against Tripoli. On 26 Aug. 1803 the *Philadelphia* captured off the coast of Spain the Moorish frigate *Mesboa* and MacDonough, being left at Gibraltar with the prize, escaped the subsequent capture which befell the officers and crew of the *Philadelphia.* In 1804 he participated in the various attacks made upon Tripoli and under Decatur assisted in the capture and destruction of the *Philadelphia,* 16 Feb. 1804. In 1810 he was furloughed and for a while commanded a vessel in the merchant service. On the outbreak of the War of 1812 he was for a time first lieutenant on the *Constitution,* and commanded for some months at Portland. In 1814 he had command of the squadron on Lake Champlain which gained an important victory at Plattsburg harbor over the British squadron commanded by Commodore George Downie. For his valuable services on this occasion he was promoted to the rank of captain, then the highest in the United States navy, and received from Congress a gold medal and an estate at Cumberland Head, near Plattsburg, from the Vermont legislature. He afterward held various commands, the last of which was on the *Constitution* in 1824, in which he made a cruise to the Mediterranean. Consult Babcock, K. C., 'Rise of American Nationality' (New York 1906).

MACDOUGAL, mak-doo'gal, **Daniel Trembly,** American botanist: b. Liberty, Ind., 16 March 1865. He was graduated at De Pauw University in 1890 and studied in Germany. In 1891–92 he was engaged in explorations in Arizona and Idaho for the United States government, and in 1893–99 was instructor in plant physiology at the University of Minnesota. He was appointed director of the laboratories of the New York Botanical Gardens in 1899, and after 1910 was director of the botanical research department of the Carnegie Institution. He was president of the American Society of Naturalists in 1910. Among his books are 'Nature and Work of Plants' (1900); 'Practical Text-book of Plant Physiology' (1902); 'Elementary Plant Physiology' (1902); 'Influence of Light and Darkness upon Growth and Development' (1903); 'Botanical Features of North American Deserts' (1908); 'The Water-Balance of Succulent Plants' (1910); 'The Condition of Parasitism in Plants' (1910); 'Organic Response' (1911); 'The Salton Sea' (1913), etc.

McDOUGALL, Alexander, American soldier: b. Island of Islay, Scotland, 1731; d. New York, 8 June 1786. He emigrated with his father to America in 1755 and later became a merchant in New York. He devoted himself to the cause of the colonies and was imprisoned for a time for writing an address called 'A Son of Liberty to the Betrayed Inhabitants of the Colony.' At the outbreak of the Revolution he enlisted in the American army, serving as colonel, brigadier-general, and in 1777 was promoted major-general. He commanded at Long Island, White Plains and also attained distinction in the action at Germantown. He was elected member of the Continental Congress in 1781 and was for a time Minister of Marine. Re-elected in 1784–85 he served for a time and then resigned, preferring active service in the field. He was elected Minister of Marine and thereby became the first Secretary of the United States Navy. He was a member of the New York State senate at his death.

McDOUGALL, George Millward, Canadian pioneer missionary: b. Kingston, Ontario, 1820; d. Canadian North West, January 1876. He removed to Georgian Bay with his parents when a child, later studied at Victoria College,

and in 1850 entered the Wesleyan Methodist ministry. He was deeply interested in the welfare of the Indians, whose habits and character he knew thoroughly, and spent his life as a missionary among them. His field covered at different times a considerable portion of the Northwest Territory and his experience made him often a valuable aid to the government in dealing with Indian affairs. He made a tour of eastern Canada and visited New York and Great Britain in 1875. His career was suddenly ended by his death on the plains within a short distance of his camp. He is commonly reputed to have perished in a snowstorm; but his son, who was with him on the journey toward camp, ascribes the end to some unknown physical infirmity as the weather was favorable and his father a master woodsman. McDougall is among the most famous of the pioneer missionaries of Canada. Consult McDougall, J., 'George Millward McDougall, Pioneer, Patriot and Missionary' (Toronto 1888).

McDOUGALL, John, Canadian missionary, son of George Millward McDougall (q.v.): b. Owen Sound, Ontario, 27 Dec. 1842. He was educated at Victoria University, entered the Methodist ministry in 1866 and was ordained in 1872. He was reared among the Indians of the Georgian Bay and Lake Superior regions and before entering the ministry he taught school in the North Western Territory. As a clergyman his work was chiefly among the Indians, where his knowledge of their language and customs made his work unusually effective, and he was also able to render important services to the government in connection with Indian affairs. He was peace commissioner after the uprisings of 1869–70 and 1885. He was also closely associated with the treaties made with the Indians in his district. He was chairman of the Saskatchewan district in 1876 and of the Indian district in 1897. Author of 'A Cree Hymn Book' (1888); 'Forest, Lake and Prairie' (1895); 'Saddle, Sled and Snowshoe' (1896); 'In the Days of the Red River Rebellion' (1900); 'On the Western Trail in the Early Seventies' (1902).

MacDOUGALL, Sir Patrick Leonard, British general and military author: b. Boulogne-sur-Mer, France, 10 Aug. 1819; d. Kingston Hill, Surrey, 28 Nov. 1894. He was educated at the military academies of Edinburgh and Sandhurst and received his commission as second lieutenant in 1836. He served as regimental officer with the Royal Canadian Rifle regiment at Toronto and at Kingston in 1844–54; served as superintendent of studies at Sandhurst the following year, and in 1855 was sent on a special mession to the Crimea. He was again superintendent at Sandhurst in 1856–58. He was appointed adjutant-general of the Canadian militia in 1865, took an active part in the suppression of the Fenian Raid of 1866 and received high commendations for his skilful organizing of the militia. In 1873–78 he was head of the intelligence branch of the War Office. He was again appointed to the command in Canada in 1878, at the time when relations were strained between England and Russia. He volunteered to organize a body of 10,000 trained soldiers for use whenever and wherever they might be needed, and the acceptance of his offer established the precedent of colonial military aid to the empire in time of need. He retired from active service in 1885. Author of 'The Theory of War' (1856); 'Modern Warfare as Influenced by Modern Artillery' (1864); 'The Army and Its Reserves' (1869), etc.

MacDOUGALL, William, Canadian journalist and statesman: b. Toronto, 1822; d. Ottawa, 29 May 1905. He studied at Victoria College, Cobourg; was admitted as a solicitor in 1847; in 1849 established the *Canadian Agriculturist;* in 1850 founded the *North American,* afterward united with the Toronto *Daily Globe,* for which he wrote until 1870. He was commissioner of Crown lands, 1862–64, and provincial secretary, 1864. From 1867–69 he was Minister of Public Works, and was lieutenant-governor of Rupert's Land, 1869–70. On his entrance into the Red River district to assume formal possession on behalf of the Dominion government of the newly-acquired territories, he was deforced by Louis Riel, and this episode marked the beginning of the Red River Insurrection.

MacDOWELL, măk-dow'ĕl, **Edward Alexander,** American composer: b. New York, 18 Dec. 1861; d. there, 23 Jan. 1908. MacDowell was Scotch-Irish by birth, if not by training and temperament. It was from his father, a man of pronounced artistic tastes, that the composer inherited or acquired that fine æsthetic sense and that highly sensitive artistic tendency which played so great a part in his life and practically determined the character of his work. MacDowell's musical education was begun at the age of eight, when Juan Buitrago, a friend of the family, gave him his first piano lessons. But not being at all precocious — MacDowell was no musical prodigy — his early progress was neither rapid nor encouraging. It was not until he came to receive instruction from the professional piano teacher, Paul Desvernine, with occasional supplementary lessons from the famous virtuoso, Teresa Carreño, that MacDowell's great musical gifts became manifest. Then, at the age of 15, the lad was taken abroad by his devoted mother for a thorough musical education. Entering the Paris Conservatory, young MacDowell studied for two years under the two eminent music masters, Marmontel (piano) and Savard (theory and composition). Going next to Germany, he continued his musical studies at the Stuttgart and Frankfort conservatories, studying piano with Karl Heymann and composition with Joachim Raff, the well-known German composer. MacDowell's unusual talent so impressed both his German teachers that in 1881 they warmly recommended their American pupil for the university chair left vacant by Heymann's own resignation. Nothing but his extreme youthfulness (MacDowell was only 20 at the time) seems to have kept from him this much coveted Frankfort professorship. Failing of this, MacDowell accepted an instructorship at the Darmstadt Conservatory. But his duties as principal piano instructor there were so onerous and his compensation so inadequate that he soon had to resign from this position. Returning to Frankfort, MacDowell devoted himself to composition and private teaching.

It was there, at Frankfort, during his student days, that MacDowell's career as a composer really began. His 'First Modern Suite

for Piano' so impressed the great Liszt, whom MacDowell was induced by Raff to visit at Weimar in 1882, that he had it performed the same year at the Allgemeiner Deutscher Musikverein festival held at Zürich. A year later this suite and its successor, 'The Second Modern Suite,' were published by the famous Leipzig music publishers, Breitkopf and Härtel. Thus encouraged by his early success, and more especially by the sincere praise of Raff, Liszt and others, MacDowell resolved to settle in Germany permanently. And, save for a short visit to America in 1884 (when he married a former pupil of his, Marian Nevins), he did live there uninterruptedly for 12 years. In 1888 MacDowell returned to America and settled in Boston, which marks a turning point in his life. His European recognition, both as pianist and as composer, naturally had paved the way for his American successes. Almost immediately on his arrival MacDowell made his first public appearance in America in the double capacity of pianist and composer, performing one of his own compositions at a Kneisel Quartet concert (19 Nov. 1888). Shortly after he played his 'Second Piano Concerto' under Theodore Thomas at New York, winning such success with this composition and its performance that he soon repeated it with the Boston Symphony Orchestra. Thenceforth MacDowell's rise to fame was phenomenal. His services as pianist were in great demand — far greater than his virtuoso ambitions — while his orchestral compositions were performed almost as soon as they were written. Between 1890, when his symphonic poem, 'Lancelot and Elaine,' was performed by the Boston Symphony Orchestra, and 1896 when the same organization placed both his 'Indian Suite' and his 'Piano Concerto' on the same program — which was a most signal honor for a new composer — MacDowell's name appeared prominently and frequently on American orchestral programs. In 1891–92, too, he gave his first piano recitals which further enhanced his American fame. A couple of years later (14 Dec. 1894) MacDowell achieved unprecedented success by his performance, with the Philharmonic Society at New York, of his own 'Second Concerto for Piano and Orchestra.' By 1896, then, his name and fame as pianist and composer were fully established in America, if not also in Europe.

That year another important turning point in MacDowell's life was reached. Accepting the chair of music in the then newly-created music department at Columbia University, MacDowell plunged into teaching with such zeal and energy — devoting almost all his time and vitality to his arduous task — that eight years of it (1896–1904) was enough to undermine his health beyond repair. In 1905, one year after MacDowell had resigned his Columbia professorship (owing to a disagreement with the faculty as to the proper place of music in the college curriculum), alarming symptoms of a mental disorder appeared, which soon culminated in hopeless insanity. In this sad state MacDowell lingered till 23 Jan. 1908, when he died in New York, in his 47th year.

The list of MacDowell's compositions is a long one. His works extant (the composer himself, in a moment of ruthless self-criticism, destroyed a number of his compositions) include two suites for orchestra (the 'Indian Suites' Nos. 1 and 2), which are his most pretentious and best-known orchestral compositions; two concertos for piano and orchestra, which rank among the best of their kind; four sonatas for piano (the 'Norse,' the 'Keltic,' the 'Eroica' and the 'Tragica'), which alone would have made any composer famous; five symphonic poems ('Hamlet and Ophelia,' 'The Saracens,' 'Lamia,' 'Lovely Alda' and the 'Lancelot and Elaine,' already mentioned), which possess much originality and considerable melodic charm; two most delightful piano suites (the 'Woodland Sketches' and the 'Sea Pieces'), which contain some of MacDowell's most popular and fascinating shorter pieces, and numerous songs of charming simplicity and melodiousness.

As may be inferred from his musical titles, MacDowell is a romantic composer. His music is program music of the poetic, not the descriptive, kind; for MacDowell does not delineate objects, but rather the moods aroused by them. A pupil and disciple of Raff, MacDowell frequently gives his music the woodland flavor. Such titles as 'Forest Idyls,' 'New England Idyls' and 'Woodland Sketches,' among others too numerous to mention, clearly indicate that MacDowell is the Wordsworth of music. His lyrical pieces show the unmistakable influence of Grieg, whose music the American composer greatly admired; while as a romanticist he should be classed with Schumann and Mendelssohn. Consult Gilman, Lawrence, 'Edward MacDowell' (New York 1909), and Page, E. F., 'Edward MacDowell; His Work and Ideals' (ib. 1910).

McDOWELL, Ephraim ("FATHER OF OVARIOTOMY"), American surgeon: b. Rockbridge County, Va., 11 Nov. 1771; d. Danville, Ky., 20 June 1830. He studied medicine at Staunton, Va., and at the University of Edinburgh, then the most famous medical institution in the world. He established himself in practice at Danville, Ky., and became known throughout the Southern and Western States as the best surgeon in his part of the country. In 1809 he performed the hitherto unknown operation of extirpation of the ovary with complete success, and twice repeated the feat before he made an official report of the cases in 1816. His delay in reporting the first case and the seeming impossibility of the performance subjected him to considerable criticism in high quarters both at home and abroad. However, the fact of the success of the operation, several times repeated, is fully substantiated and the method he conceived and carried out has been but little modified, with the exception of asepsis and the use of anæsthetics. In lithotomy he had operated 22 times before 1828 without a fatality. Author of a report of his most famous cases in the *Eclectic Repertory and Analytic Review* (1817). Consult Gross, S. D., 'Origin of Ovariotomy' (1853); Jackson, J. B., 'Biographical Sketch of Ephraim McDowell' (1873); Letcher, J. H., 'Memoir of Ephraim McDowell' (1875).

McDOWELL, Irvin, American soldier: b. near Columbus, Ohio, 15 Oct. 1818; d. San Francisco, Cal., 5 May 1885. He studied at the College de Troyes, France, and was graduated at West Point in 1838. During the Canadian troubles he was stationed on the Niagara

and on the Maine frontiers, and in 1841 served at West Point as assistant instructor in tactics, becoming adjutant in 1845. In 1845 he went to Mexico as aide-de-camp to General Wood and for gallant conduct at Buena Vista in 1847 was promoted brevet captain, shortly afterward attaining the rank of assistant adjutant-general. Subsequently he was stationed at the War Department in Washington and in 1856 was raised to the rank of brevet major. He was on General Wood's staff at the outbreak of the Civil War and assisted in inspecting and organizing the volunteer troops at Washington. In May 1861 he was made brigadier-general of the volunteers and given command of the Army of the Potomac. Constrained by the impatience of the North, McDowell moved in July to meet the enemy and despite his carefully laid plan met a disastrous defeat at Bull Run, 21 July 1861, owing to the imperfect organization of his raw recruits. Shortly after McClellan was given command of the army and McDowell was retained at the head of one of its divisions. In 1862 he was promoted major-general of volunteers and placed in command of the First corps, which became the Army of the Rappahannock, stationed to guard Washington. In August 1862 he received command of the Third corps of the Army of Virginia and fought under General Pope at the battles of Cedar Mountain, Rappahannock Station and the second battle of Bull Run, where he performed especially good service. He was removed from the field in September 1862. Considering this action of the War Department a direct reflection upon his military services, he asked for an investigation, the result of which was favorable to him. From May to July 1863 he was president of a board appointed to investigate alleged cotton frauds, and during the following 10 months presided over the board for retiring disabled officers. In July 1864 he was placed in command of the Department of the Pacific Coast, and in March 1865 was made brevet major-general in recognition of his gallant services at Cedar Mountain. In 1872 he succeeded General Meade as major-general in the regular army and was in command of various military departments until 1882, when he was retired. The last years of his life were spent in California.

McDOWELL, James, American statesman: b. in Rockbridge County, Va., 1796; d. 1851. He was graduated at Princeton in 1817; in 1831 was elected to the Virginia legislature; was governor of that State, 1842–44, and from 1847 to 1851 represented it in Congress. He favored the gradual abolition of slavery, although advocating the claim of State rights. As orator and debater in Congress he bore a prominent part in the proceedings of that body leading up to the Compromise of 1850.

McDOWELL, William Fraser, American Methodist Episcopal bishop: b. Millersburgh, Ohio, 4 Feb. 1858. He was educated at the Ohio Wesleyan and Boston universities and was ordained in the Methodist ministry in 1882. He held pastorates at Lodi, Oberlin and Tiffin, Ohio, and in 1890–99 he was chancellor of the University of Denver. He was corresponding secretary of the board of education of the Methodist Church in 1899–1904 and was elected bishop in 1904. He was Cole lecturer at Vanderbilt University in 1910, has served as international commissioner of the Y. M. C. A. since 1899 and since 1906 has been president of the board of trustees of Northwestern University. He made an official tour of India, China, Japan and the Philippines in 1910–11. Author of 'In the School of Christ' (1910); 'A Man's Religion' (1913); 'Good Ministers of Jesus' (1917).

MACDUFF, măk-dŭf', Scottish thane, or Earl of Fife, a half-mythical personage, commemorated in Shakespeare's play, 'Macbeth.' He is said to have been the principal agent in the overthrow of the usurper Macbeth and the restoration of Malcolm Canmore to the throne of Scotland. For this he was granted many privileges, among them that of a place of refuge to which he and his descendants could flee in case of committing unpremeditated murder. This sanctuary, in the form of a cross, stood till 1559, near Newburgh in Fife, in the pass leading to Strathearn. It was then demolished by the Reformers, but its pedestal yet remains.

McDUFFIE, măk-dŭf'ĭ, **George,** American statesman and orator: b. in Columbia (now Warren) County, Ga., 1788; d. in Sumter District, S. C., 11 March 1851. He was graduated at South Carolina College in 1813, admitted to the bar in 1814 and in 1818 elected to the South Carolina legislature. From 1821 to 1834 he was a member of Congress, and from 1834 to 1836 governor of South Carolina. In 1843 he took his seat in the United States Senate, resigning on account of impaired health in 1846. In his political views and in his Congressional career, he was a close follower of J. C. Calhoun (q.v.), being at the outset a liberal constructionist in constitutional questions, but afterward becoming a strong opponent of the tariff and other economic policies of the government, and also a bold advocate of nullification. Although a supporter of Andrew Jackson (q.v.) in 1828, he became bitterly antagonistic to him, not only in respect to the tariff and State rights, but especially so on the question of the United States Bank, which, as chairman of the Committee on Ways and Means, he strongly defended against the hostile policy of the President. In 1832, as a member of the South Carolina Nullification Convention, he drafted the address of South Carolina to the people of the United States. He was one of the ablest orators of his day, and his prominence in public affairs was maintained in spite of an early wound received in a duel, from which he suffered for the remainder of his life.

MACÉ, Jean, zhŏn mä-sā, French educator and writer: b. Paris, France, 22 April 1815; d. there, 13 Dec. 1894. He was educated at the Collège Stanislas, served in the French army, 1842–45, was editor of *La République* in 1848 and as such was a strong supporter of the Revolution of that year. In 1851, on the *coup d'état,* he had to withdraw from Paris, and subsequently taught school in Alsace for 10 years. In 1866 he founded a league of instruction in the Belgian manner. He was decorated with the Legion of Honor in 1880, and elected senator in 1883. He was the author of many popular books for young people, the aim of which was mainly educational, among them his best-known work, 'Contes de petit-chateau' (1862), called in the English translation 'Home Fairy Tales'; 'History of a Mouthful of Bread' (1861);

'Servants of the Stomach' (1866); 'France Before the Franks' (1881).

MACE (Lat. *macir*, Greek *μάκερ*, an East Indian spice), an aromatic spice made from the arillode or false aril which covers the seed of a nutmeg (*Myristica fragrans*). The yellow external covering of the nutmeg (q.v.) being removed, the red, rather fleshy, arillode which partially conceals the nutmeg is encountered. After drying in the sun for several days this becomes more or less translucent and usually orange yellow and waxy. In this form it is largely exported from the Spice Islands, where it is native, and from the West Indies, where it has been introduced into cultivation. The powerful but agreeable nutmeg-like odor and flavor characteristic of it are due to a volatile oil which is obtained by distillation for use in perfumery and culinary articles. A buttery fixed oil obtained by expression is used after the admixture of the volatile oil under the names nutmeg balsam and nutmeg butter. White mace is obtained from *M. otoba* and red mace from *M. tingens;* also a low grade from *M. fatua*, but this is rarely found in the market. Mace is also largely used whole or ground in cookery.

MACE, a weapon of war formerly in use in Europe, chiefly among the cavalry, as late as the 16th century, and still used among savage tribes. It consists merely of a staff about five feet long, with a knob at the end made of iron or some other heavy substance. The knob was sometimes covered with spikes. In England the mace is used as an emblem of the officers of state, before whom it is carried. It is made of the precious metals, or of copper, gilt and ornamented with a crown, globe and cross.

MACEDO, Joaquim Manoel de, hō-ā-kēn' mä'noo-el dā mä-sā'dō, Brazilian poet, novelist and statesman: b. Sao João d'Itaborahi, 24 June 1820; d. Rio de Janeiro, 11 April 1882. He studied medicine, but presently began to write and became professor of national history in the College of Dom Pedro at Rio de Janeiro. He was one of the most prominent of Brazilian authors in the 19th century, and being keenly interested in politics was elected to the Brazilian Chamber in 1854. His works include 'Moreninha,' a novel (1844; 5th ed., revised, 1877); 'O Moço Louro,' a novel of the early stages of the Portuguese conquest (1845); 'O Dous Amores' (1848); 'Vicentina' (1853); 'A Nebulosa,' a poem (1857), his greatest work, consisting of six cantos in unrhymed hendecasyllables; 'Cobé,' a drama; 'Fantasma Branco,' a comedy (1856); 'Nociones de cronografia do Brasil' (1873; translated into French by Halbout), etc.

MACEDO, José Agostinho de Padre, Portuguese poet and author: b. Beja, 1761; d. 1831. He received his education in Latin and rhetoric under the Oratorians at Lisbon and became a member of the Augustinian Order in 1778. Temperamentally unfitted for a monastic life he failed to conform to the discipline of the order and in consequence was imprisoned in one convent or another the greater share of the time. He eventually abandoned the monastery and his subsequent excesses caused him to be unfrocked in 1792. Intercession on the part of influential friends, however, secured for him a papal brief which secularized him but restored his ecclesiastical status. He then entered journalism and his preaching gained for him a foremost position among the orators of his day. In 1802 he was appointed a court preacher. He established and contributed to a large number of journals and was famous for his keen satire and wit, although he also gained the reputation of being the "chief libeller of Portugal." He was a staunch adherent of absolutism and seriously advocated the massacre of all opponents of Miguel. He was censor of books in 1824–29, when he resigned upon being threatened with proceedings by his own political party, his support having become harmful to its interests. He had gained a considerable reputation through his verse, which introduced into Portugal didactic and descriptive poetry, and his 'Meditation' (1813) was a notable production. His ambition then led him to covet the place held by Camoens as Portugal's leading poet, and in 1814 he published 'Oriente' for which he unwisely chose the subject of Camoens' 'Lusiads,' the discovery by Gama of the sea route to India. While the verse itself was not without strength and grace the epic, as a whole, was flat and insipid, and failed utterly to cause its author to outshine Camoens. Macedo then published his 'Censura dos Lusiados,' in which he bitterly attacked Camoens, and brought upon himself Bocage's scathing 'Pena de Talião.' His 'Os Burros' is no less pitiless in its betrayal of his own evil character than shameless in its excoriation of men and women in all grades of society, living or dead. He translated the 'Odes' of Horace and made several attempts at drama but these are not particularly notable. He was at his best in his odes to Wellington and to Alexander, and in the verse in his 'Lyra anacreontica.' There is some doubt concerning 'A Demonstration of the Existence of God' as being from his pen, but it is usually credited to him and shows high ability. He was notorious for his ingratitude, and merciless in his satire, but he died with many friends and a great reputation, although his fame was of brief duration. Consult T. Braga's edition of 'Memorias para la vida intima de José Agostinho de Macedo' (1899); 'Cartas e opusculos' (1900).

MACEDONIA, măs-ę-dō'nĭ-ą, an ancient monarchical territory now comprised in Serbia, Greece and (to a small extent) in Bulgaria, and prior to the War in the Balkans (1913) largely included in the Turkish vilayets or provinces of Monastir and Saloniki. It is inhabited by a turbulent heterogeneous population of Turks, Greeks, Bulgarians, Serbians, Wallachians, Albanians and Jews. Roughly it extends from the sanjak of Novi-Bazar in Serbia to Salonika and from the borders of Albania to the meridian of Kavala in Greece. Its earliest name was Emathia, which remained the name of the district between the Haliacmon and the Axius, two rivers falling into the Thermaic Gulf, now the Gulf of Saloniki. This district was the earliest seat of the Macedonian monarchy. There was also an older form of the name Macedonia, namely, Macetia, whence the Macedonians were sometimes called Macetæ, even after the name Macetia had come to be disused. In the time of Herodotus the name

Macedonia was applied only to the district situated south and west of the Lydias, another river which falls into the Thermaic Gulf, and which flows between the two already mentioned. Philip of Macedonia extended his kingdom as far as the Lake of Lychnitis, in Illyria, in the west, Mount Scardus and Mount Orbelus in the north (so as to include the whole of Pæonia), and the river Nestus on the northeast. He added also the peninsula of Chalcidice. The part which he conquered from Thrace, lying between the Strymon and Nestus, was called *Macedonia adjecta*. The provinces of Macedonia were, in general, known by name before the time of Herodotus. In the time of Philip there were 19. Macedonia was inhabited by two different races — the Thracians, to whom belonged the Pæonians and Pelagonians, and the Illyrians. The language of the southern Macedonians shows that there must have been a large admixture of Dorian settlers among them. Pliny speaks of 150 different tribes who dwelt here at an early period. They were divided into several small states, which were incessantly at war with the Thracians and Illyrians, till Philip and Alexander gave the ascendency to one, and made it the most powerful in the world. The first of these princes, who came to the throne in 359 B.C., taking advantage of the strength of the country and the warlike disposition of its inhabitants, reduced Greece, which was distracted by internecine broils, in the battle of Chæronea, 338 B.C. His son, Alexander, subdued Asia, and by an uninterrupted series of victories for 10 successive years made Macedonia in a short time the mistress of half the world. After his death this immense empire was divided. Macedonia received anew its ancient limits, and after several battles lost its dominion over Greece. The alliance of Philip V with Carthage during the Second Punic War gave occasion to this catastrophe. The Romans delayed their revenge for a season; but when Hannibal was conquered they sent over T. Quintius Flaminius, who defeated Philip at the battle of Cynoscephalæ (197 B.C.) and compelled him to sue for peace, which was only granted upon his agreeing to acknowledge the independence of Greece, to surrender his vessels, to reduce his army to 500 men and defray the expenses of the war. Perseus, the successor of Philip, having taken up arms against Rome, was totally defeated at Pydna by Paulus Æmilius, 168 B.C., and the Romans took possession of the country. Indignant at their acts of oppression, the Macedonian nobility and the whole nation rebelled under Andriscus. But after a long struggle they were overcome by Quintus Cæcilius Macedonicus; the nobility were exiled, and the country became a Roman province, 148 B.C. As such it is mentioned in the New Testament, and Saint Paul's letters to the Thessalonians and Philippians are addressed to Macedonian Christians. In 395 A.D., after the dissolution of the Roman Empire, Macedonia became part of the Byzantine Empire. It came under Turkish domination in the 15th century. While the name has no modern territorial significance, it has come into considerable political prominence in connection with the conflict of nationalities in European Turkey and the races of the Balkans Peninsula, among whom the only object in common is a desire to throw off Turkish rule, the Bulgarians there desiring to be governed from Sofia, the Serbians from Belgrade, the Greeks from Athens and the Turks by the Young Turk party when it shall be established in Constantinople.

In addition to this question of nationality is one of religion, which complicates matters considerably. There are seven chief religious sects in Macedonia: the adherents of the original Greek Church; those of the schismatic Bulgarian Church; those of the New Greek Church, who recognize the patriarch in Constantinople; those Bulgarians and Serbians, converts of American missionaries, who call themselves Protestants; the Wallacks, who are an offshoot of the ancient Greek Church; those who practise the Jewish faith; and the Mohammedans.

The Turkish government, in administering the affairs of Macedonia, adopted the principle of assisting and protecting the weak and of snubbing and persecuting the strong or predominating party; thus, in a certain district where the Greek was strongest he was least popular with the Turkish authorities. Near the Bulgarian frontier, where the Bulgarian element was practically held in subjection, several public offices were held by Greeks, and so on.

This mode of government led in 1895 to a Bulgarian uprising and in 1896 to a Greek revolt, but would probably long since have proved its success from a Turkish point of view were it not for the fact that the Macedonian Committee in Sofia, a society formed for the purpose of conducting a nationalist campaign in Macedonia to effect freedom from Turkish rule, discovered its real nature and set about to disrupt it. The result was the insurrection in 1903 headed by Boris Sarafoff, the avowed aim of which was to provoke the Turks to massacre Christians and to commit acts that would arouse Christendom and compel the Great Powers to expel them from Europe. The insurrection was crushed by the Porte, with a comparative absence of the atrocities and cruelties that formerly characterized Turkish warfare. Autonomous institutions had been provided for Macedonian Christians by the Berlin Congress of 1878, and Austria and Russia, acting with the authority of Europe, drew up a drastic reform scheme which provided that civilian agents of the two governments must accompany the Turkish inspector-general, to direct his attention to the needs of the population, and to report to their governments what is done and what left undone. The reorganization of the police in the disturbed vilayets was put under the charge of a foreign officer. Mixed commissions of Mohammedans and Christians were to report on crimes and outrages. The sultan was to be "requested" to allot funds for the repatriation of exiles, for the immediate needs of the populations and for the rebuilding of their homes. Taxation of the expelled Christians was remitted for a year, while the formation of bands of Bashi-Bazouks was absolutely prevented.

The Balkan Wars of 1912–13 were waged largely for the possession of Macedonia, and the access to the sea it would afford, by the younger Balkan powers. As a result of the first war, waged in 1912 by members of the

Balkan League, which included Montenegro, Serbia, Bulgaria and Greece, Turkey was deprived of considerable territory, the division of which among the mutually contending Christian states of the peninsula was left unsettled by the unsatisfactory treaty of peace signed on 30 May 1913. War again broke out in the succeeding month: Bulgaria attacking Serbia and Greece on 30 June, and Rumania joining forces with the latter on 9 July. Three days after Turkey stepped into the field and Adrianople (taken by Bulgaria from Turkey in the former war) was recaptured. This war ended with the humiliation of Bulgaria; and when the treaty of peace was signed at Bucharest (29 September) the net result of the two wars for her was the handing back to Turkey of territory won in the preceding year, and (apart from a very small part) the division of Macedonia between Serbia and Greece. See WAR, EUROPEAN.

MACEDONIAN, The. See UNITED STATES AND MACEDONIAN, BATTLE OF.

MACEDONIANS, followers of Macedonius, author of the Macedonian heresy; also called Pneumatomachi, or "Adversaries of the Spirit." The Macedonians came into existence toward the decline of the Arian controversy, when Macedonius became patriarch of Constantinople (341), and taught that the Holy Ghost was "subordinate to the Father and to the Son, unlike to them in substance, and a creature." He was a semi-Arian; was deposed by the Arians in 360; and his special tenets condemned at the Council of Constantinople in 381. In that council the clauses defining the nature of the Holy Ghost were added to the Nicene Creed.

MACEIÓ, mä-sä-yō', Brazil, formerly MAÇAYO, city and capital of the state of Alagôas, on the Atlantic Coast, 135 miles southwest of Pernambuco. The city has a cathedral, lyceum, government and other buildings. It has manufactures of machinery and cotton goods, and considerable ship-building is carried on here. Cotton, corn and hides are the chief items of export. Maceió is the seat of a United States consular agent. Pop. 33,000.

McENTEE, Jervis, American painter: b. Rondout, N. Y., 14 July 1828; d. there, 27 Jan. 1891. He was educated at the Liberal Institute, Clinton, N. Y., and later studied under F. E. Church. He also visited Europe in 1869, studying in the principal galleries and sketching in Italy and Switzerland. He made his first contribution to the American Academy of Design in 1853, was elected associate of that institution in 1860 and academician in 1861. After his return from Europe he took a studio in the famous studio building in West 10th street, New York, and devoted himself to landscape painting, although in later years he executed a number of figure canvasses. He belonged to the "Hudson River School" of artists and his favorite subject was the autumn type of landscape, although his work is by no means confined to one phase or season. A sale of his work in New York in 1888 disposed of 75 of his pictures which he considered the best of the preceding 10 years' work, and after his death 100 more were sold. Among his paintings are 'The Melancholy Days Have Come' (1860); 'Sea From Shore' (1873); 'Old Mill in Winter' (1874); 'Clouds' (1879); 'Glimpse of Hunter Mountain' (1886); 'A Cliff in the Catskills' (1888). His 'Autumn Landscape' hangs in the Metropolitan Museum, New York.

MACEO, mä-sā'ō, **Antonio,** Cuban patriot: b. Santiago de Cuba, 14 July 1848; d. near Mariel, 2 Dec. 1896. He joined the insurgent army as a private in 1868 and though without martial training his natural military ability and personal magnetism as a leader soon brought him to the front, making him second only to Gomez. Under his skilful leadership Martinez Campos was defeated at Demajayabo and at La Galleta; his campaign in Baracoa in 1878 evidenced masterly generalship, as did also his utter rout of Santacledes at San Ulpiano. Maceo alone of all the Cuban generals refused to sign the Peace of Zanjón and made for two months a brave effort to reanimate the exhausted revolutionary spirit. Finding his copatriots thoroughly discouraged, he abandoned the struggle and still refusing to sign the peace, made a tour of the United States and other countries in America seeking support for the cause of Cuban independence. He was the first of the Cuban leaders to land in 1895, and in the revolution which followed took a prominent part. His achievements in the campaign in Pinar del Rio province, and his battles at Paralejo, Jobito, Mal Tiempo and Candelaria are among the most brilliant feats in the history of Cuba's long struggle for independence. While crossing the trocha between Majana and Mariel, attended only by his staff, he was surrounded by a Spanish force and killed.

MACEO, José, hō-sā, Rafael, Cuban patriot: b. Santiago de Cuba, 1846; d. La Loma del Gato, Cuba, 5 July 1896. He was a brother of Antonio Maceo (q.v.) and took a conspicuous part in the Rebellion of 1868–78. He remained in Santiago de Cuba after the Peace of Zanjón, which he with his brother refused to sign. He was prominently connected with the uprising of 1879 in which he was captured and sent to Spain. An attempted escape to Gibraltar resulted in his deportation to the Fortress La Mola at Mahon, in the Balearic Isles, whence he succeeded in making his escape to Algiers. He lived in Costa Rica fom 1885 until the outbreak of the rebellion in Cuba in 1895, when he at once joined the insurrectionary army. He raised a large force which he commanded with signal success at Jobito and later was victorious over Canellas at Sao del Indio. He was killed in a furious engagement at La Loma del Gato in which the Cubans were finally victorious. For an adequate account of the importance of the Maceo brothers consult General Weyler's 'Mi Mando en Cuba, 10 Febrers 1896 á 31 Octubre 1897' (5 vols., Madrid 1910–11).

MACERATA, mä-chä-rä'tä, central Italy, (1) an episcopal city, capital of the province of the same name, picturesquely situated on an eminence 1,207 feet high, between the Apennines and the sea, 21 miles south of Ancona. It is encircled by walls, pierced by six gates, has a cathedral, provincial palace and theatre on the central public square, town-hall (13th century), a college founded in 1290, museum, etc. Terra cotta, chemicals and matches are among its manufactures. Pop. of commune

22,940. (2) The province has an area of 1,087 square miles.

McEWEN, măk-ū'ĕn, **Walter,** American painter: b. Chicago, Ill., 1860. He studied under Cormon and Tony Robert-Fleury in Paris, afterward living chiefly abroad. His work includes landscapes, portraits, decorative panels and figure subjects and is marked by excellent sense of line and strong feeling for color. He executed panels for the Liberal Arts Building at the Columbian Exposition, Chicago, and for the Congressional Library, Washington. He has been awarded numerous prizes, including gold medals at Berlin, Vienna and Munich, the Lippincott prize at Philadelphia and the Harris prize at Chicago. He is an officer of the Legion of Honor and of the Belgian Order of Leopold. He served on the International Jury of Awards at the Panama Exposition in 1915. Many of his paintings have been acquired by public galleries. Among them are 'Sunday in Holland' (Luxembourg); 'An Ancestor' (Corcoran Gallery, Washington); 'Judgment of Paris' (Art Institute, Chicago).

McFARLAND, măk'fär'lănd, **John Horace,** American master printer and civic improvement expert: b. McAlisterville, Juniata County Pa., 24 Sept. 1859. He was privately educated, learned the printing business and in 1878 established his own business, which after several changes was incorporated as the J. Horace McFarland Company in 1891. In 1890–93 he printed and was a contributor to *American Gardening,* and in 1901–04 he printed *Country Life in America,* also contributing articles and photographs. He edited the 'Beautiful America' department in *The Ladies' Home Journal* in 1904–07. He is an active member of various leagues for improving and beautifying American cities and villages, is an ardent advocate of national parks and forest conservation and organized a campaign for the preservation of Niagara Falls. He edited the *American Rose Annual* in 1916–18; furnished photographic illustrations for Mabel Osgood Wright's 'Flowers and Ferns in their Haunts,' and assisted in illustrating and printed Bailey's 'Standard Cyclopedia of Horticulture.' He has contributed to numerous periodicals and is author of 'Photographing Flowers and Trees' (1902); 'Laying Out the Home Grounds' (1915); 'My Growing Garden' (1915).

McFARLAND, John Thomas, American Methodist clergyman: b. Mount Vernon, Ind., 2 Jan. 1851; d. 22 Dec. 1913. He was educated at the Iowa Wesleyan University, Simpson College, Iowa, and at Boston University, and was ordained in the Methodist ministry in 1873. He filled pastorates at Millersburg and Sweetland Centre, Iowa; Portsmouth, R. I.; Elmwood and Peoria, Ill.; was president of the Iowa Wesleyan University in 1884–91; pastor of Grace Church, Jacksonville, Ill., of New York Avenue Church, Brooklyn, and First Church, Topeka, Kan. He was editor of the Sunday School literature of the Methodist Church from 1904 until his death. Author of 'Preservation vs. The Rescue of the Child'; 'The Book and the Child'; 'Etchings of the Master.'

MACFARLANE, Alexander, American mathematician: b. Blairgowrie, Scotland, 21 April 1851; d. 28 Aug. 1913. He was graduated at Edinburgh University in 1875, taking his D.Sc. in 1878, and in 1881 was appointed examiner in mathematics there. He became professor of physics at the University of Texas in 1885 and from 1897 was lecturer on mathematics at Lehigh University. He was a Fellow of the Royal Society of Edinburgh and a member of the Washington Academy of Sciences. Author of 'Algebra of Logic' (1879); 'Physical Arithmetic' (1885); 'Papers on Space Analysis' (1894); 'Bibliography of Quaternions and Allied Mathematics' (1904), etc.

MacFARREN, Sir **George Alexander,** English composer: b. London, England, 2 March 1813; d. there, 31 Oct. 1887. He was educated at the Royal Academy of Music, where in 1837 he became a professor of harmony and composition and in 1875 principal. In the same year he was elected professor of music in Cambridge University. Among his compositions are the operas 'The Devil's Opera' (1838); 'Robin Hood' (1860), and the oratorios 'St. John the Baptist' (1873); 'King David' (1883), etc. He also wrote several valuable treatises: 'Harmony' (1860); 'Counterpoint' (1879), etc. He was knighted in 1883. In 1860 he became blind and his wife thereafter wrote his compositions from his dictation.

McFAUL, James Augustine, American Roman Catholic prelate: b. Larne, County Antrim, Ireland, 6 June 1850; d. 16 June 1917. At an early age he attended Saint Vincent's College, Beatty, Pa., finishing his classical studies at Saint Francis Xavier's College, New York City, and subsequently pursuing his theological course at Seton Hall, South Orange, N. J. He was ordained priest 26 May 1877, Orange, Paterson, Jersey City, Newark and New Brunswick, N. J., being in turn the scene of his first labors in the ministry. In 1878 he was named assistant at Saint Mary's Church, Trenton, N. J., and afterward pastor of the church of Our Lady Star of the Sea, Long Branch, N. J. Some years later he assumed the rectorship of the Cathedral at Trenton, and then became secretary, chancellor and vicar-general of the diocese. On the death of Bishop O'Farrell in 1894 Father McFaul was chosen his successor, and was consecrated at Trenton 18 October of that year. Noteworthy among his achievements were the erection of an orphan asylum at Hopewell and of a home for the aged at Laurenceville, N. J., also a day nursery in Trenton. He is the author of some excellent articles on 'American Citizenship,' published a volume of pastoral letters, etc., and was a leading power in forming the Saint Michael's Diocesan Union. However, he is perhaps best known as the founder of the Federation of Catholic Societies and the reorganizer of the Ancient Order of Hibernians, American branch.

MacFLECKNOE, or **A SATIRE UPON THE TRUE-BLEW PROTESTANT POET, T. S.,** a satire by John Dryden (q.v.), published in 1682, in which Thomas Shadwell has the principal part. Dryden here introduced the name of Richard Flecknoe (1600–1678?), who by the author is represented as an Irish priest famed for his bad verse, but who is described by Andrew Marvell as "an English priest at Rome." Flecknoe was disliked by Dryden because of the former's abuse of the players and his attacks on their morality or rather absence of it. The name served also as a

stalking-horse from behind which Shadwell might be pilloried as the adopted son and heir of Flecknoe. The satire served Pope as model for his 'Dunciad.' The authorship of 'MacFlecknoe' long disputed and attributed to Dryden, was called in question in 1918 when there appeared a possibility that it might have been written by John Oldham, Dryden's friend. A manuscript of the latter's poems in the Bodleian Library contains 'MacFlecknoe,' but Dryden claimed authorship of the piece and his friend Oldham never did. Consult Belden, H. M., 'The Authorship of MacFlecknoe' (in *Modern Language Notes,* December 1918).

McFLIMSEY, măk flĭm'zĭ, **Flora,** the heroine of the once famous poem 'Nothing to Wear,' by William Allen Butler (q.v.). It was published in 1857 and became immediately popular.

MacGAHAN, măk-gă'hăn, **Januarius Aloysius,** American journalist and war correspondent: b. near New Lexington, Ohio, 12 June 1844; d. Constantinople, 9 June 1878. He followed different callings in Western States, then went to Europe and studied law in Brussels. Upon the outbreak of the Franco-German War in 1870 he went to the field as correspondent of the New York *Herald,* and was with Bourbaki's army. He visited Bordeaux and Lyons and his interviews with clerical, monarchical and republican leaders attracted wide attention. He was the only newspaper correspondent in Paris during the whole period of the Commune and narrowly escaped death. In 1873, after heroic exertions, with extreme hardships, he reached the Russian army before Khiva, and sent to the *Herald* reports of the campaign which won for him high admiration both here and in Europe, his account of the capitulation of the city being regarded as "a masterpiece of military journalism." Returning to America, he went to Cuba to report on the *Virginius* affair, then to Spain, upon the Carlist uprising, where he spent 10 months with the army of Don Carlos, was captured by the Republicans, mistaken for a Carlist, condemned to death and saved by the intervention of the United States Minister. He then went to England, and in 1875 accompanied the Arctic expedition on the *Pandora.* In 1876 he joined the Turkish army, in the service of the London *Daily News,* and did memorable work in his description of the Bulgarian atrocities, his accounts standing approved before the world in face of all attempts to discredit them. In behalf of Bulgaria he appealed to Russia, was at the front in the Russo-Turkish War that followed, and was hailed as a chief instrument of Bulgaria's resulting independence. While nursing a friend he contracted a fever which in a few days caused his death. In 1884 the Ohio legislature secured the removal of his body from its foreign grave to its final resting-place at New Lexington. He wrote 'Campaigning on the Oxus, and the Fall of Khiva' (1874); 'Under the Northern Lights' (1876), and 'Turkish Atrocities in Bulgaria' (1876).

McGEE, mą-gē', **Anita Newcomb,** American physician: b. Washington, D. C., 4 Dec. 1864. She is a daughter of Simon Newcomb (q.v.); was educated at Newnham College, Cambridge, England, at the University of Geneva and at other institutions in Europe; also graduated in medicine at Columbian (now George Washington) University, 1892, and took a post-graduate course in gynecology at the Johns Hopkins Hospital. From 1892 to 1896 she practised in Washington. In 1888 she married W. J. McGee (q.v.). She has held prominent positions in the National Society of the Daughters of the American Revolution, and from April to September 1898 was director of its hospital corps, which selected women nurses for army and navy. In August 1898 to December 1899 she was acting assistant surgeon in the United States army, being the first woman to hold such a position, and was assigned to duty in the surgeon-general's office, where she organized the army nurse corps. When the Congress approved this work by making the nurse corps of trained women a permanent part of the army the pioneer stage was passed, and she resigned 31 Dec. 1900. In 1904, acting as president of the Society of Spanish-American War Nurses and as representative of Philadelphia Red Cross Society and by agreement with Japanese government, took a party of trained nurses formerly in United States army to serve in the Japanese army for six months gratuitously. Was appointed by the Japanese Minister of War as supervisor of nurses, which placed her in the same rank with officers of the Japanese army, and inspected and reported on relative nursing conditions. She is a recipient of the Japanese Imperial Order of the Sacred Crown and of a special Japanese Red Cross decoration and two Russo-Japanese War medals. She is a member of the Association of Military Surgeons of the United States and of the Spanish War Veterans, being the only woman eligible. She lectured on hygiene at the University of California in 1911, and has lectured throughout the United States and written for various magazines.

McGEE, Thomas D'Arcy, Canadian journalist and politician: b. Carlingford, Ireland, 13 April 1825; d. Ottawa, Ontario, 7 April 1868. In 1842 he emigrated to the United States. In 1845 he returned to Ireland, but complicity in the Young Ireland movement and an abortive attempt to raise rebellion among the Glasgow Irish caused him to seek refuge in the United States in 1848. McGee then edited the New York *Nation* for two years, became converted to constitutional methods for the redress of Irish grievances and went to Canada in 1857 where he was editor of the *The New Era.* He entered Parliament in 1857; was president of the Council 1864–67 and Minister of Agriculture on the carrying through of confederation, which his eloquence and persuasiveness had done much to popularize. His assassination was the result of his opposition to the Fenian movement. He published 'History of Ireland' (1862); 'Speeches and Addresses of the British-American Union' (1865), etc.

McGEE, W J, American scientist: b. in Dubuque County, Iowa, 17 April 1853; d. Washington, D. C., 4 Sept. 1912. He was self-educated, and from 1873 to 1875 surveyed land and practised in the courts. He also improved several agricultural implements, some of which he patented. In 1877–81 he made geologic and topographic surveys of northeastern Iowa, and for the United States Geological Survey he surveyed and mapped 300,000 square miles in the southeastern part of the country, and performed many other important services in the depart-

ments of geology, ethnology and anthropology. From 1893 to 1903 he was ethnologist in charge of the Bureau of American Ethnology. He was president of the American Anthropological Association, chief of the Department of Anthropology and Ethnology of the Louisiana Purchase Exposition and associate editor of the *National Geographic Magazine*. He wrote 'Geology of Chesapeake Bay' (1888); 'Pleistocene History of Northeastern Iowa' (1891); 'The Lafayette Formation' (1892); 'Potable Waters of the Eastern United States' (1894); 'The Siouan Indians' (1897); 'Primitive Trephining in Peru' (1898); 'The Seri Indians' (1899); 'Primitive Numbers' (1901); 'Soil Erosion' (1911); 'Wells and Subsoil Water' (1913), and many scientific memoirs.

McGIFFERT, mą-gĭf'ĕrt, **Arthur Cushman,** American theologian and author: b. Sauquoit, N. Y., 4 March 1861. He was graduated at the Western Reserve College in 1882, and at Union Theological Seminary in 1885, and continued his studies at the universities of Berlin and Marburg, Germany, and in France and Italy. In 1888–90 he was instructor in Church history at Lane Theological Seminary, Cincinnati, and professor there 1890–93, since when he has been professor of Church history of Union Theological Seminary, New York. In 1897 he published 'A History of Christianity in the Apostolic Age,' and in consequence of criticism and threatened denominational disturbance, involving his own probable trial for heresy, to which this book gave rise, he withdrew from the Presbyterian ministry, and later, while still retaining his professorship, joined the Congregational Church. His other publications include 'Dialogue Between a Christian and a Jew,' doctor's thesis (1888), and a translation of Eusebius' 'Church History,' with prolegomena and notes (1890); 'The Apostles Creed' (1902); 'Protestant Thought Before Kant' (1911); 'Martin Luther, the Man and his Work' (1911); 'The Rise of Modern Religious Ideas' (1915).

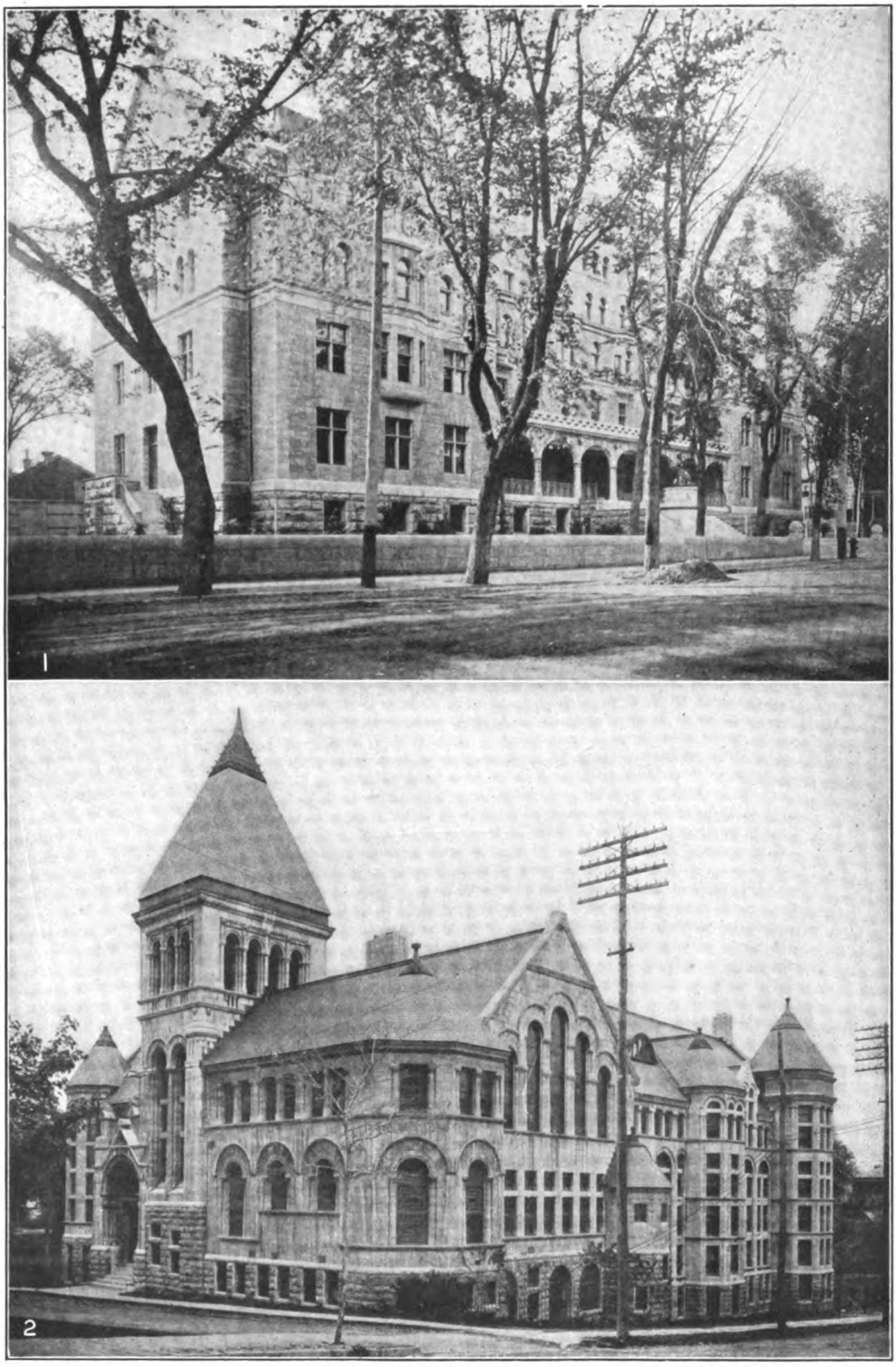
McGIFFIN, mą-gĭf'ĭn, **Philo Norton,** American naval officer: b. Washington County, Pa., 1863; d. New York, 11 Feb. 1897. He was graduated in 1882 at the United States Naval Academy and was stationed in China, and at the outbreak of the war between China and France was permitted to resign from the United States navy to enter the service of China. He established a naval academy at Wei-hai-wei, of which he had charge. When the China-Japan War broke out he was placed in command of the *Chen Yuen,* and was the first American or European to command a modern warship in action. He was in command at the battle of Yalu River, in which action he was so severely injured that he afterward shot himself at a hospital in New York.

McGILL, mą-gĭl', **James,** Canadian philanthropist: b. Glasgow, Scotland, 6 Oct. 1744; d. Montreal, 19 Dec. 1813. He was educated in Glasgow and in 1770 removed to Canada, where he engaged in the northwest fur-trade, afterward becoming a merchant in Montreal. McGill was a member of the Parliament of Lower Canada and held the rank of brigadier-general in the War of 1812. He used much of his wealth in philanthropic work and at his death founded McGill College (q.v.) in Montreal.

McGILL COLLEGE AND UNIVERSITY, in Montreal, Canada, was founded in 1811 by James McGill (q.v.). By will he left an estate known as the "Burnside Estate," which contained 47 acres of land and a fine manor house, near Montreal, and £10,000 to the "Royal Institution for the Advancement of Learning," for the establishment of a university in Lower Canada (province of Quebec). The bequest was valued at the time as worth about $120,000. It was stipulated that one of the colleges of the university should be known in perpetuity as McGill College. McGill University includes a group of schools or colleges and is affiliated with Cambridge, Oxford and Dublin universities. Many generous benefactors have supplied means for the foundation of various departments or faculties. The late Lord Strathcona and Mount Royal erected and endowed the Royal Victoria College for Women. This is a residential college, and is only one of many gifts from the same donor, the last of which was a donation of $620,000 for the erection of a medical building. Sir William Macdonald erected, equipped and endowed the Macdonald Chemistry and Mining Building, the Macdonald Physics Building and the Macdonald Engineering Building. He also gave $200,000 endowment to the Law School, besides other large donations. He has been the chief benefactor of the university. Peter Redpath gave the University Library and the Peter Redpath Museum. The degrees conferred by the university are B.A. and B.Sc., in the Faculty of Arts, and to both men and women; B.C.L. and D.C.L. in the Faculty of Law; B. Arch. and B.Sc., in the Faculty of Applied Science; M.D., C.M. and D.D.S., in the Faculty of Medicine; B.S.A. in the Faculty of Agriculture; Mus. Bach. and Mus. Doc. in the Department of Music and M.A., M.Sc., D.Sc., and D.Litt. in the Graduate School. There are four affiliated theological colleges which adjoin the university grounds. The supreme authority rests with the Crown and is exercised by the governor-general of Canada. The governors, 25 in number, manage the finances, appoint professors, pass statutes for the general government of the university and attend to other important matters. The president of the board of governors is ex officio, the chancellor. The vice-chancellor is the principal, who is the head of the academic department and chief administrative officer. The fellows number 43 and are chosen from all the faculties, affiliated colleges and other bodies, with due regard to the representation of each. They constitute the corporation, the highest academic body, which deals with courses of study, matriculation, discipline, degrees, etc. There are connected with the university about 1,500 students and 200 professors and lecturers, besides a large number of demonstrators. The library contains about 154,000 volumes. The grounds and buildings are valued at more than $8,000,000. The university is increasing its fine plant and equipment as fast as its finances will permit.

MacGILLICUDDY'S REEKS, (mą-gĭl-ĭ-kŭd'ĭ) Ireland, a picturesque mountain range, in County Kerry, extending for 13½ miles from the lakes of Killarney on the east to Lough Carra on the west, and covering an area of 28 square miles. It is the loftiest moun-

McGILL UNIVERSITY



1 Royal Victoria College for Women

2 Library Building

tain range in Ireland, culminating in Carrantuohill, 3,414 feet high.

McGILLIVRAY, mą-gĭl'i-vrā, **Alexander,** chief of the Creek Indians: b. in Alabama about 1740; d. Pensacola, Fla., 17 Feb. 1793. His father was a Scottish merchant of good family and his mother a half-breed. He received a good education at Charleston, S. C.; was placed in a mercantile establishment in Savannah; but soon returned to the Creek country, where he became partner in a large trading house and rose to a high position among the Indians. After the death of his mother, a member of the ruling stock, he became chief of the Creeks, having received a call from a formal council, and styled himself Emperor of the Creek Nation. During the Revolution the McGillivrays, father and son, were zealous adherents of the royal cause, the former holding the rank of a colonel in the British service. After the war Alexander McGillivray, in behalf of the Creek confederacy, entered into an alliance with Spain, of which government he was made a commissary, with the rank and pay of colonel. In 1790 he was induced by President Washington to visit New York, where he eventually signed a treaty yielding certain disputed lands lying on the Oconee. He was also persuaded to withdraw from Spanish service and was rewarded with an appointment as agent for the United States, with the rank and pay of brigadier-general.

McGILVARY, Evander Bradley, American linguist and philosopher: b. Bangkok, Siam, 19 July 1864, of American parents. He was graduated from Davidson College in 1884 and from Princeton in 1888. He was appointed as instructor in the classics at Bingham School in 1884, and in 1889–90 studied at Princeton Theological Seminary. From 1891 to 1894 he was translator for the Presbyterian Board of Foreign Missions in Siam, and in 1894 began graduate work at the University of California, where he later became assistant professor. In 1899 he was appointed Sage professor of ethics at Cornell. In 1905 he was appointed professor of philosophy at the University of Wisconsin. In 1910–11 he was president of the Western Philosophical Association and in 1912–13 of the American Philosophical Association. He has translated the Gospels of Matthew, Luke and John, and the Acts of the Apostles into the Lao dialect of Siamese. Has contributed to various philosophical journals and to encyclopædias.

McGLYNN, mą-glĭn', **Edward,** American Roman Catholic clergyman: b. New York, 27 Sept. 1837; d. Newburg, N. Y., 7 Jan. 1900. He was educated at the College of the Propaganda in Rome, and from 1866 was pastor of Saint Stephen's Church in New York. He favored the education of children by the State rather than in parochial schools and in 1886 warmly supported the candidacy of Henry George for the mayoralty, thereby bringing upon himself the censure of the Church. He was summoned to Rome to exculpate himself, but refused to go, pleading his ill-health. Persisting in his refusal he was excommunicated in 1887. He was one of the founders of the Anti-Poverty Society and was its president. In 1893, after a hearing before the Pope's delegate, Monsignor Satolli, the ban of excommunication was removed, after signing a document drawn up by the apostolic delegate to the effect that his economic views were not in conflict with the Catholic faith. He was in charge of Saint Mary's parish in Newburg at his death.

McGOVERN, mą-gŏv'ĕrn, **John,** American author: b. Troy, N. Y., 18 Feb. 1850. He was connected for 16 years with the Chicago *Tribune,* and since 1880 has been engaged in literary work and lecturing, chiefly on great writers and historical characters. In the action of S. E. Gross, author of the play 'The Merchant Prince of Cornville,' against Edmond Rostrand, author of 'Cyrano de Bergerac,' he acted as literary expert for the former, furnishing in the case over 700 exhibits containing innumerable parallels between the two dramas. The United States Court at Chicago issued a decree in 1902 sustaining the claim of Gross to priority of authorship and forbidding the representation of 'Cyrano de Bergerac' in this country. McGovern's numerous writings include 'The Empire of Information' (1880); 'A Pastoral Poem' (1882); 'The Toiler's Diadem' (1885); 'Under the Open Sky' (1890); 'King Darwin,' a novel (1894); 'American Statesmen' (1898); 'Famous Women of the World' (1898); 'John McGovern's Poems' (1902); 'The Golden Legacy'; 'History of Grain' (1913); 'Trees' psychologically considered; 'Hospitality'; 'In Bohemia,' etc.

McGRATH, mă-grăth', **Harold,** American journalist and novelist: b. Syracuse, N. Y., 4 Sept. 1871. He was educated in Syracuse and has been engaged in journalism since 1890. He has written 'Arms and the Woman' (1899); 'The Puppet Crown' (1901); 'The Grey Cloak' (1903); 'The Princess Elopes' (1905); 'Enchantment' (1905); 'Hearts and Masks' (1905); 'Half a Rogue' (1906); 'The Watteau Shepherdess,' an operetta (1906); 'The Best Man' (1907); 'The Enchanted Hat' (1908); 'The Lure of the Mask' (1908); 'The Goose Girl' (1909); 'A Splendid Hazard' (1910); 'The Carpet from Bagdad' (1911); 'Place of Honeymoons' (1912); 'Parrot and Co.' (1912); 'Deuces Wild' (1913); 'Adventures of Kathlyn' (1913); 'Million Dollar Mystery' (1914); 'Pidgin Island' (1914); 'Voice in the Fog' (1915).

McGRATH, Patrick Thomas, British-American journalist: b. Saint John's, Newfoundland, 16 Dec. 1868. He was educated at the Christian Brothers' School, Saint John's, and in 1889 became a reporter on the Saint John's *Evening Herald.* He was promoted acting editor in 1893, and in 1894–1907 was editor. He established the *Evening Chronicle,* which in 1912 was united with the *Herald,* and became president of the company. He has acted as Newfoundland correspondent of the London *Times* since 1904 and is an extensive contributor to both British and American periodicals. He has been president of the Legislative Council of Newfoundland since 1915. He assisted in the preparation of the colony case concerning the French and American fisheries and was the colony's secretary on the occasion of the Dominion's Royal Commission visit to Newfoundland in 1914. He has been honorary secretary of the Newfoundland Patriotic Fund, the Newfoundland Regiment Finance Committee and the Newfoundland War Pensions

Board since 1914; and chairman of the High-Cost-of-Living Commission since 1917. Author of 'From Ocean to Ocean' (1911); 'Newfoundland in 1911.'

McGREADY, mą-grā'dĭ, **James**, American Presbyterian clergyman: b. in Pennsylvania about 1760; d. 1817. He studied for the ministry in the school of John McMillan, of Cannonsburg, Pa., and in 1788 was licensed to preach. After some years of work in North Carolina, in 1796 he removed to southwestern Kentucky, and under his direction began the great revival of religion which culminated in 1800 and became memorable in the religious history of the country. He organized and conducted the first camp-meeting, and employed as preachers unordained young men without special theological training, thereby provoking dissension in the Presbyterian Church. Out of this disagreement arose the Cumberland Presbyterian Church (see PRESBYTERIAN CHURCH), organized in 1810. McGready, however, afterward became reconciled to the older Church and resumed his fellowship in it. Two volumes of his sermons were published years after his death, the first at Louisville, Ky., in 1831, the second at Nashville, Tenn., in 1833. Consult Davidson, 'History of the Presbyterian Church in the State of Kentucky' (New York 1847); Edson, 'Early Presbyterianism in Indiana' (1898); Foote, 'Sketches of North Carolina, Historical and Biographical' (New York 1850; 2d series, 1855); Smith, 'History of the Cumberland Presbyterian Church.'

MacGREGOR, măk-grĕg'ẽr, **John** ("Rob Roy"), Scottish traveler, writer and philanthropist: b. Gravesend, 24 Jan. 1825; d. Boscombe, 16 July 1892. He studied at Trinity College, Dublin, and was graduated from Trinity College, Cambridge, in 1847. He was called to the bar in 1851, but after a brief period in which he devoted himself to the law of patents he abandoned the profession and spent his time in travel and in works of philanthropy. He traveled in Europe, Egypt, Palestine, Russia, Algeria and America. He was deeply interested in the history and theory of marine propulsion and was largely instrumental in the introduction of canoeing into British sports. He constructed a canoe which he christened *Rob Roy*, and in which he made extended journeys. His books giving accounts of these expeditions were widely and deservedly popular. He was possessed of ample resources and gave liberally to philanthropic purposes. He sketched cleverly and illustrated his own books, and in early days occasionally contributed sketches to *Punch*. Besides numerous magazine articles he was author of 'Three Days in the East' (1850); 'Our Brothers and Cousins, A Tour in Canada' (1859); 'A Thousand Miles in the Rob Roy Canoe' (1866); 'The Rob Roy on the Baltic' (1867); 'The Rob Roy on the Jordan, Red Sea and Gennesareth' (1869), etc.

McGUFFEY, măk-gŭf'fẽ, **William Holmes**, American educator: b. Washington County, Pa., 23 Sept. 1800; d. Charlottesville, Va., 4 May 1887. He was graduated at Washington College, Pa., in 1826, was appointed professor of ancient languages at Miami University in that year, and in 1832 became professor of moral philosophy there. He was appointed president of Cincinnati College in 1836 and of Ohio University in 1839. He was professor of moral philosophy at Woodward College, Cincinnati, in 1843–45, and thereafter until his death he was professor of moral philosophy and political economy at the University of Virginia. He prepared the series of school reading- and spelling-books known under his name and for many years widely popular in the schools of the United States.

McGUIRE, mă-gwīr', **Hunter Holmes**, American surgeon: b. Winchester, Pa., 11 Oct. 1835; d. near Richmond, Va., 19 Sept. 1900. He was graduated from the Winchester Medical College in 1855, and from the Medical College of Virginia in 1858, studying also in the medical schools of New Orleans and Philadelphia. He was professor of anatomy at the Winchester Medical College in 1856–58 and afterward practised in Philadelphia. He enlisted in the Confederate army at the outbreak of the Civil War, became medical director of the Army of the Shenandoah Valley and later of the Second Army Corps. He was in attendance upon General "Stonewall" Jackson at the time of his death in 1863. In 1865–78 he was professor of surgery at the Virginia Medical College, Richmond. He organized Saint Luke's Home for the Sick in Richmond, with a training school for nurses. He was president of the American Medical Association in 1893.

MACH, mäh, **Ernst**, Austrian physicist and philosopher: b. Turas, Moravia, Austria, 18 Feb. 1838; d. 9 Feb. 1916. After a partly private secondary education he studied at the University of Vienna, taking his doctor's degree in physics in 1860. After spending several years as *privatdocent* he was appointed professor of mathematics at Gratz and in 1867 was called to the chair of physics at the University of Prague. Here he published in 1883 his first important work, 'Die Mechanik in ihrer Entwickelung historisch-kritisch dargestellt,' which has run through seven German and several English editions. Having turned his attention to the relation of physiological and physical processes, he next produced his equally epoch-making 'Analyse der Empfindungen' (1886; 6th ed., 1911). Owing to his increased interest in epistemological and historical problems, Mach gladly accepted in 1895 the offer of a philosophical chair at Vienna, where he read on the history and theory of the inductive sciences. The following year appeared his 'Principien der Wärmelehre,' while his university lectures ultimately took the shape of a substantial volume in 1905 under the caption 'Erkenntnis und Irrtum.' A paralytic stroke suffered in 1898 reduced the remainder of his life to a cripple's martyrdom, though it did not interfere with his mental activity. In spite of his liberal position in politics he was honored with the title of a court chancellor and was made a member of the upper chamber of the Austrian Parliament.

Mach's aim was to liberate science from metaphysical conceptions and thus he became in a sense a precursor of pragmatism. His general trend of thought exerted a profound influence on men like William James, Jacques Loeb, Karl Pearson and Wilhelm Ostwald, and his attempt to substitute the mathematical notion of function in place of the time-honored concept of causality has recently found an ad-

vocate in Bertrand Russell. His definition of science as an economical description rather than an explanation of the universe aroused considerable discussion in philosophical circles. Sympathetic insight, impartiality, a singularly sane judgment and an almost complete freedom from preconceptions render Mach an ideal historian of science and one of the trustworthiest leaders of advanced thought. His principal works are accessible in English translations. For a brief exposition of his philosophy with biographical notes consult Carus, Paul, 'Professor Mach and his Work' (in *The Monist*, January 1911, pp. 18–42).

ROBERT H. LOWIE,
American Museum of Natural History.

MÁCHA, mä'kȧ, Charles Ignace, Czech poet: b. Prague, 10 Nov. 1810; d. Leitmeritz, 5 Oct. 1836. His style of poetry is full of sentiment and reflection, a forerunner of the present Czech school of poetry, strongly influenced by Byronic "Weltschmerz," i.e., the spirit bred by the realization of disharmony between ideals and concrete facts of reality. He studied in Vienna and Prague. Extreme poverty caused pulmonary trouble, from which he died after a lingering illness. His chief work, 'Maj' (Prague 1836), is a lyrical epic. His historic tales, such as 'The Gypsies,' etc., are in the style of Walter Scott. His collected works were published in Prague (1862).

MACHÆRODUS, mā-kē'rō-dŭs, a genus of huge extinct cats, fossil in the Miocene and subsequent formations, and including the largest of the *Nimravidæ*. See SABRE-TOOTHED TIGER.

MACHAIRODONTINÆ, mą-kī'rō-dŏn-tī'nī, an extinct subfamily of *Felidæ*, including the sabre-toothed cats and their allies. This group became separated from the typical cats (*Felinæ*) in the Oligocene epoch, and remained a numerous and powerful element of the carnivora of the world until the close of the Pleistocene. The general form and structure were catlike, and produced an equally effective armament, except, perhaps, in speed, for the limbs were shorter and heavier as a rule than in the feline cats of similar size, and the hind foot had five toes, instead of four. Another difference was in the comparative shortness of the tail. Mainly, however, the specialization of this subfamily was in the dentition, which differed from that of the cats in many particulars, and especially in the extraordinary development of the upper canines into huge stabbing-tusks, especially striking in *Smilodon*, one of the most modern and widely distributed American genera. Other genera are *Hoplophoneus*, a primitive genus of the White River beds, with species of small size; *Machairodus*, *Eusmilus* and *Dinictis* were other White River genera of importance, while later forms illustrate the genera *Archælurus* and *Nimravus*.

MACHAR, mą-kär', Agnes Maule (FIDELIS), Canadian author: b. Kingston, Ontario, about 1856. She was educated at Kingston and at an early age her contributions began appearing in the magazines of Canada, England and the United States. She is author of a volume of verse, 'Lays of the True North'; two historical works, 'Memorials of Rev. Dr. Machar' — the author's father; 'The Story of Old Kingston' (1908); 'Stories of the British Empire' (1913); and the novels, 'Katie Johnston's Cross'; 'Lost and Won'; 'Roland Graeme, Knight' (1892); 'The Heir of Fairmount Grange,' etc.

McHENRY, măk-hĕn'rī, James, American military surgeon and politician: b. Ballymena, County Antrim, Ireland, 1753; d. 1816. He had studied at Dublin, when, about 1771, he came to America, and in Philadelphia soon entered upon the study of medicine under Dr. Benjamin Rush (q.v.). On the outbreak of the Revoluton he became surgeon of the 5th Pennsylvania battalion; in November 1776 was taken prisoner at Fort Washington; was paroled in the following January, and in March 1778 exchanged. In May of that year he was made assistant private secretary to Washington, and held that position until October 1780, when as major he was appointed to a place on the staff of Lafayette. Elected in 1781 to the Maryland senate, he continued a member of that body until 1786, being also during the second half of that period a delegate to the Confederation Congress. In 1787 he was made a member of the Constitutional Convention; in 1789 was elected to the general assembly of Maryland, and sat in the senate of that State, 1791–96, when he was appointed by Washington Secretary of War, retaining that position in the cabinet under John Adams' administration until 1800. As an ardent Federalist he used his influence in favor of a strong national defense, and was a zealous partisan of Alexander Hamilton. His partisanship in favor of Hamilton led to a request for his resignation from President Adams. After resigning from Adams' Cabinet he spent the rest of his life in Maryland. Fort McHenry (q.v.) was named after him.

McHENRY, James, American physician and author: b. Larne, County Antrim, Ireland, 20 Dec. 1785; d. there, 21 July 1845. He was educated in Dublin and Glasgow, practised his profession for a time in Ireland and in 1817 emigrated to the United States and finally settled in Philadelphia, where he practised medicine and was engaged in mercantile business. In 1842 he was appointed United States consul at Londonderry and held that post until his death. Among his works are 'The Usurper; an Historical Tragedy' (played in Philadelphia 1820); 'The Wilderness, or Braddock's Times: A Tale of the West' (2 vols., 1823); 'Jackson's Wreath' (1829); 'O'Halloran, or the Insurgent' (1824); 'The Betrothed of Wyoming' (2d ed., 1830), etc.

McHENRY, Fort. See FORT MCHENRY.

MACHETE, mą-chā'tā, a short sword-like tool, half knife, half cleaver, used in Cuba and other countries of tropical America for cutting cane and as a weapon in war. It was first brought into prominence during the Cuban revolution.

MACHIAS, ma-chī'ȧs, Me., town, county-seat of Washington County, on the Machias River, and on the Washington County Railroad, about 120 miles east by north of Augusta. It is about 12 miles from the mouth of Machias River. A trading post was established here in 1633, by Englishmen, but after a few months they were forced by the French to abandon the place. The first permanent settlement was made in 1763, and in 1784 it was incorporated

as a town. It was besieged by the British from 1 Aug. to 1 Nov. 1777, and other attacks were made later. The original township of Machias was divided into East Machias, Machiasport, Marshfield and Whitneyville. The chief industries are ship-building, lumbering and fishing. It has considerable coast trade. The principal buildings are the government building, the courthouse, the United States Marine Hospital and the Porter Memorial Library. Pop. 2,089. Consult 'Memorial of the Centennial Anniversary of the Settlement of Machias' (Machias 1863).

MACHIAVELLI, Niccolo, nē-kō-lō' mā-kē-ä-vĕl'lē or măk-ĭ-ą-vel'lĭ, Italian historian and statesman, possibly the greatest prose writer of the Italian Renaissance: b. Florence, 3 May 1469; d. there, 22 June 1527. Of Niccolo's early life and education we know nothing. No trace of him remains previous to his 26th year. But of his times and the scenes amid which he grew up, we know much. It was the calm but demoralizing era of Lorenzo the Magnificent. Machiavelli was a true child of his time. He too was thoroughly imbued with the spirit of the Renaissance; and looked back, fascinated, on the ideals of that ancient world that was being revivified for the men of his day. But philosophy, letters and art were not the only heritage that the by-gone age had handed down; politics — the building of states and of empires — this also had engaged the minds of the men of that age, and it was this aspect of their activity that fired the imagination of the young Florentine. From his writings we know he was widely read in the Latin and Italian classics. But Virgil and Horace appealed to him less than Livy, and Dante the poet was less to him than Dante the politician; for he read his classics, not as others, to drink in their music or be led captive by their beauty, but to derive lessons in statecraft and penetrate into the secrets of the successful empire-builders of the past. It is equally certain, from a study of his works, that he had not mastered Greek. Like Ariosto, Machiavelli was indebted for his superb literary technique solely to the study of the literature of his own nation.

With the expulsion of the Medici from Florence, Machiavelli, at 30, emerged from obscurity to play a most important rôle in the Florentine politics of the succeeding decade and a half. In 1498 he was elected secretary to the Ten of War and Peace, and from 1498 to 1512 was a zealous, patriotic and indefatigable servant of the republic. His energy was untiring, his activity ceaseless and many-sided. He conducted the voluminous diplomatic correspondence devolving upon his bureau, drew up memorials and plans in affairs of state for the use and guidance of the Ten, undertook the reorganization of the Florentine troops and went himself on a succession of embassies, ranging in importance from those to petty Italian states up to those to the court of France and of the emperor. He was by nature well adapted to the peculiar needs of the diplomacy of that day; and the training he received in that school must in turn have reacted on him to confirm his native bent and accentuate it until it became the distinguishing characteristic of the man. His first lessons in politics and statecraft were derived from Livy's history of the not overscrupulous Romans; and when he comes to take his lessons at first hand, it is in the midst of the intrigues of republican Florence, or at the court of a Caterina Sforza, or in the camp of a Cesare Borgia. Small wonder that his conception of politics should have omitted to take account of honesty and the moral law; and that he conceived "the idea of giving to politics an assured and scientific basis, treating them as having a proper and distinct value of their own, entirely apart from their moral value."

During this period of his political activity we have a large number of state papers and private letters from his pen; and two works of literary cast. These are his 'Decennale': historic narratives, cast into poetic form, of Italian events. The first treats of the decade beginning 1494; and the second, an unfinished fragment, of the decade beginning 1504. They are written in easy *terzine*, and are noteworthy as expressing the sentiment for a united Italy.

When in 1512 the Medici returned to Florence in the train of her invader, Machiavelli was dismissed from his office and banished for a year from the confines of the city. Later, on suspicion of being concerned in a plot against the Medici, he was thrown into prison and tortured. He was afterward included in a general pardon granted by Leo X. But Machiavelli did not return to public life until 1525; and this interval of enforced leisure from affairs of state was the period of his literary activity. A number of comedies, minor poems and short prose compositions did not rise above mediocrity. But in one dramatic effort he rose to the stature of genius. His 'Mandragola' achieved a flattering success, both at Rome and in Florence. It has been pronounced the finest comedy of the Italian stage; Macaulay rated it as inferior only to the greatest of Molière's. In its form, its spontaneity, vivacity and wit, it is not surpassed by Shakespeare; but it is a biting satire on religion and morality, with not even a hint of a moral to redeem it.

His lesser prose works are the 'Life of Castruccio Castracani,' and the 'Art of War,' a treatise anticipating much of our modern tactics. A more ambitious undertaking, and his largest work, is the 'History of Florence. At the suggestion of the Cardinal de Medici, the directors of the studio of Florence commissioned Machiavelli to employ himself in writing a history of Florence, "from whatever period he might think fit to select, and either in the Latin or the Tuscan tongue, according to his taste." He was to receive 100 florins a year for two years to enable him to pursue the work. He chose his native tongue; and revised and polished his work until it became a model of style, and in its best passages justifies his claim to the title of the best and most finished of Italian prose writers.

But though Machiavelli had the historical style, he lacked historical perspective; he arranged his matter not according to objective value, but placed in the boldest relief those events that best lent support to his own theories of politics and statecraft. He makes his facts to be as he wishes them, rather than as he knows them to be. To Machiavelli history was largely to be written as a *Tendenzroman*,— manufactured to point a preconceived moral,

Though Machiavelli wrote history, poetry and comedy, it is not by these he is remembered. The works that have made his name a synonym, and given it a place in every tongue, were written almost in the first year of his retirement from political life: 'The Prince' and the 'Discourses on the First Ten Books of Titus Livius.' Each is a treatise on statecraft; together they form a complete and unified treatise, and represent an attempt to formulate inductively a science of politics. The 'Discourses' study republican institutions, 'The Prince' monarchical ones. The first is the more elementary and would come first in logical arrangement. But in the writing of them Machiavelli had in view more than the foundation of a science of politics. He was anxious to win the favor of the Medici; and as these were not so much interested in how republics are best built up, he completed 'The Prince' first, and sent it forth dedicated "to the magnificent Lorenzo, son of Piero de' Medici." In the 'Discourses,' the author essays "a new science of statesmanship, based on the experience of human events and history." In that day of worship of the ancient world, Machiavelli endeavors to draw men to a study of its politics as well as its art. In Livy he finds the field for this study.

In his commentary on the course of Romulus in the founding of Rome, we find the keynote of Machiavelli's system of political science. His one aim is the building of a state; his one thought, how best to accomplish his aim. Means are therefore to be selected, and to be judged, solely as regards their effectiveness to the business in hand. Ordinary means are of course to be preferred but extraordinary must be used when needed.

In 'The Prince,' a short treatise of 26 chapters, and making little more than a hundred octavo pages, Machiavelli gives more succinct and emphatic expression to the principles of his new political science. It is the best known of all his works. It is the one always connected with his name, and which has made his name famous. For the model of his prince, Machiavelli took Cesare Borgia and cites him as an example worthy of imitation; and he has shared in the execration that posterity has heaped upon Borgia. The strangest moral contradictions abound throughout 'The Prince,' as they do in all Machiavelli's writings. He is saint or devil according as you select your extracts from his writings.

Shakespeare, reflecting English thought, uses his name as the superlative for craft and murderous treachery. But later years have raised up defenders for him, and his rehabilitation is still going on. He has been lauded as "the noblest and purest of patriots," and more ardent admirers could "even praise his generosity, nobility, and exquisite delicacy of mind, and go so far as to declare him an incomparable model of public and private virtue."

His rehabilitation proceeds from two causes. Later research has shown that perhaps he only reflected his time; and his works breathe a passionate longing for that Italian unity which in our day has been realized. He may be worthy canonization as a national saint; but those who are more interested in the integrity of moral standards than in Italian unity will doubtless continue to refuse beatification to one who indeed knew the Roman *virtus*, but was insensible to the nature of virtue as understood by the followers of Christ. And no amount of research into the history of his age can make his principles less vicious in themselves. A better understanding of his day can only lessen the boldness of the relief in which he has heretofore stood out in history. He was probably no worse than many of his fellows. He only gave a scientific formulation to their practices. He dared openly to avow and justify the principles that their actions implied. They paid to virtue the court of hypocrisy, and like the Pharisee of the earlier time, preached righteousness and did evil; but Machiavelli was more daring, and when he served the devil, disdained to go about his business in the livery of heaven. (See PRINCE, THE). Among the editions of the collective works of Machiavelli may be mentioned those of Milan, 1810–11; Florence, 1813; Milan, 1821–22; Florence, 1826, 1843; and Florence (6 vols., 1873–77); Boston English translation (1891). The rendering of the 'Art of War' and 'The Prince' (in the 'Tudor Translations' Vols. XXXIX and XL, London 1905), with Cust's introduction, is an admirable piece of work. Consult Dyer, 'Machiavelli and the Modern State' (Boston 1904); Morley, John, 'Machiavelli' (London 1898); Mourrisson, 'Machiavelli' (Paris 1883); Tommasini, 'La vita e gli scritti di Niccolo Machiavelli' (Turin 1882); Villari, 'Niccolò Machiavelli e i suoi tempi' (Florence 1877–82), and Burd's study (in the 'Cambridge Modern History' Vol. I, Cambridge 1902), with bibliography.

MACHINE COMPOSITION. See COMPOSING MACHINES.

MACHINE DESIGN. See DRAWING, MECHANICS.

MACHINE ENGRAVING, a mechanical process for engraving on wood, metal or stone. Since 1880 numerous machines have been invented to produce regular tints, geometrical and other designs and patterns, far more rapidly than by hand work. The most complex engraving is now executed wholly by machinery. Engraving by mechanical means is now generally employed in the making of bank-notes, diplomas, stock certificates and other papers and documents, where special designs are required. Elaborate gearing systems have been introduced whereby the cutting tools execute a certain number of symmetrical motions and thus produce elaborate geometrical patterns. The first engraving machine was the invention of Wilson Lowry and was employed to engrave the plain background, skies, etc., of a plate. Most modern machines are so fitted that the cutting tool may be moved a certain definite distance after each cut so that the succeeding cut will be a line parallel to and at a regular distance from the last. The cutting tool is also fitted so that the depth and breadth of the cut may be easily regulated. The cutting edge is usually of highly-tempered steel for metal work, except in the case of copper, which is often coated with varnish, next scratched with the design and afterward etched by acid. For stone work, the cutting tool has a diamond-point and weights on the holder regulate the depth of the cut. See BANK NOTES, MANUFACTURE OF.

MACHINE FORGING. The art of the blacksmith, working by hand at the forge and

anvil, has almost wholly disappeared, and the shaping of wrought iron and steel is now performed by machines. The exact duplication of parts of machinery began in the United States about 1854, and it became necessary to have forgings of uniform size so that they could be properly handled in special fixtures or holders while being machined to exact dimensions.

Drop Forging.— In the first attempt to obtain uniform forgings the smith hammered by hand the rough stock into a rude suggestion of the shape wanted so as to properly distribute the material and then placed it in an impression cut in a block of steel or cast to shape and forced it into the cavity by a series of blows from hand hammer and sledge.

The growing demand for firearms and other accurately made mechanisms developed the necessity for improvements in this line which kept pace with the requirements of the times, until the drop-hammer was produced. These hammers are named invariably by the weight of the hammer-head or ram and they range in sizes from 50 to 5,000 pounds.

Hammers are also constructed to operate by steam power of heavier types. They lift the ram or hammer head and drive it downward by steam power in a manner similar to the regulation steam-hammer. The regular belt-driven drop-hammer, as used in drop-forging, is operated usually by a treadle which the workman trips with his foot. This movement releases a clamp or catch which holds up the hammer-head and allows it to fall or drop. It is raised by the friction of two rolls which revolve rapidly, gripping the surface of a board which is wedged into a slot in the top of the hammer-head or ram. The hammer-head is clamped or latched at the end of the upstroke by an automatic attachment and released at the will of the operator.

The hammer-head or ram is made usually with a dovetail opening at its bottom, into which is placed the upper die. It is held firmly in position by a key driven into place by sledging. The base or anvil of the drop-hammer is made of cast iron or cast steel, and a forged steel seat or holder for the lower die is keyed into the base in a similar manner. This seat or holder is frequently called a "sow" or "shoe," and is adapted merely to save useless wear of the base. It can be renewed at a small cost. A similar dovetail opening is made in this holder into which the lower die is placed. This is keyed into exact position to match the upper die so that when the faces of the dies meet at the end of the down stroke the complete impression is formed.

Drop-hammers are made generally of cast iron, i.e., the base or anvil, the side rails or guides and the lifter frame. The working parts are made from forged steel. Various heights of the fall or drop of the hammer-head can be had by shifting a "latch" or "dog" on the operating rod. From six inches to five feet fall can be obtained if desired. Foundations are best made of solid concrete. In connection with the drop-hammer a press is used to remove by a trimming operation the "flash" or surplus metal which spreads out between the dies after the impression therein is filled. This "flash" is sheared off either hot or cold as the character of the work permits.

Making the Dies.— A model of the part to be forged is made, usually of wood, if it be a form not clearly shown by a drawing. When given this model or a scale drawing and the required weight of the finished forging, the die-sinker has the principal data required by him to make the dies. After selecting the proper size blocks which have been planed smooth and made with dovetails or shanks, the die-sinker determines from his model the best parting line for the forging in much the same way as does the pattern-maker on a pattern for a casting, but the analogy between the two is comparatively slight as the conditions are radically different.

The pattern-maker can use cores and loose pieces to make cavities and overhanging parts, but the die-sinker is practically limited to a die opening in two parts, which must be made to stand the roughest usage. The outline of the piece to be forged is drawn on the surface of the die which has been coppered with a blue vitriol solution, this causing the lines to stand out sharply. The metal is then removed in a manner that is most expedient for that particular example. If the outline be circular the stock is turned out on a lathe. If the shape of the forging be such that other means are required for removing the metal from the die, the profiling machine readily furnishes a way for following the most complicated forms by means of milling cutters of various shapes and sizes. The shaper and milling machines are also impressed into service as well as the planer and drill.

Chipping by hand is commonly done, and in nearly every case a file, riffle, scraper and some emery cloth are required to finish the impression to the required smoothness and regularity.

The forming of an irregular cavity in the face of a high carbon steel die so that when its mating die is matched to it the shape of the space enclosed will not vary from the specified dimensions more than 2-1,000ths of an inch either way is an operation requiring skill and patience.

After the complete impression is made a proof can be taken by filling the cavity with melted lead. A shallow space is cut in the face of each around the impression. This is technically called the flash of the die. As it is practically impossible for the drop-forger to form the bar or billet of steel into just the shape and size required for the forging, this space must be left for the overflow of surplus metal.

If the article to be forged is of a simple form only one pair of forging dies is necessary as the "roughing" or "breakdown" impressions can be cut in the same pair of blocks which contains the finishing impressions. If the piece be more complicated, separate "roughing" or "breakdown" dies are necessary.

Trimming dies, to be used in the press, are necessary to remove the flash. They are made in male and female form; the upper part being the male die and the lower one the female. The male die is made of the outline of the forging through the parting line, and with its face conforming to all the irregularities of the upper part of the forging. The female die is open at the bottom so that the trimmed forging can fall through it into a receptacle under the press. It is also made with its cutting edge conforming to the parting line.

The dies are then heated carefully in furnaces, the heat of which is usually determined by a pyrometer to ensure uniformity of temperature, and are then hardened and tempered. Any warping in hardening which may occur is remedied by grinding the surfaces with an emery wheel. See DIES AND DIE MAKING.

The operation of drop-forging consists of first heating the bar or piece to a proper temperature. The heat depends entirely on the quality of the metal used. It is then placed in the "roughing" or "breakdown" impression and given a number of blows which shape it roughly into form and it is finally placed in the finishing impression and forged to the exact shape. The flash is then trimmed off in the press and the forging is practically complete.

The number of blows required depends entirely on the shape and size of the forging. Some pieces can be made by two or three blows while others may require as many as 100.

If the forgings are made of high carbon steel it is frequently necessary to anneal them so that they can be readily machined, and in many cases pickling in a weak solution of sulphuric acid is resorted to, so as to remove the scale or oxidation which forms on the surface of each forging while cooling.

Drop-forgings can be made from iron, steel, copper, bronze or aluminum, or from any metal which will not disintegrate during heating or while being worked. For instance, brass cannot be forged successfully. They can vary in weight — from a fractional part of an ounce to over 100 pounds each.

Upsetting and Forging Machines.— Toward the close of the 19th century it became recognized that forging could be accomplished by pressure as well as by blows, and this idea was developed into the commercial upsetting and forging machines which now handle the bulk of small parts and a good many large parts of modern machines. Hammer-blows cause jar and vibration which are destructive to the machine itself, and require heavy foundations, heavy bed-plates, etc. The pressure machines do their work with less noise and more scientifically. The very much reduced cost of building automobiles and a great variety of duplicate machines that are turned out in large numbers is due largely to the quick shaping made possible by machine forging. An upsetting and forging machine is made with a very heavy steel bed. The opposed dies for gripping the work are gripped in the machine, and the pressure is applied by a toggle-joint mechanism. In all such machines it is necessary to limit the pressure, else excess would break the machine. This limitation is accomplished in two ways — by placing heavy springs in the machine which give when a certain pressure is attained; and by locking the back of one of the die supports with a bolt of a given strength, arranged between hard square edges which will cut or shear off the bolt when the pressure reaches above a given point.

The method of making a common hexagonal nut in such a forging machine consists in (1) placing the dies in the forging machine; (2) heating a bar of iron between 1,400° and 1,600° F. — the temperature varying with the character of the iron; (3) thrusting the red-hot end of the bar into the lower die in the forging machine, and throwing the lever to cause the machine to squeeze, which upsets the end of the bar and shapes it for a nut; (4) withdrawing the bar quickly and placing in the upper die; (5) repeating the squeeze, which forces the hole through the nut, leaving the removed metal on the bar, and separating the nut. The nut is delivered with a slight fin, which has to be removed, when it is ready to go to the thread-cutter.

The front axle of an automobile may be forged in one of these pressure forging machines in about seven operations. The last squeezing operation delivers the completely formed axle. Any quantity of more or less intricately formed parts are now made of wrought iron and steel in this manner, the heavier operations being done on the steam-hammer, as a rule.

The forging machine is also used for welding or joining separate pieces by pressure. It is just as easy to apply a flux to assist the joining in the forging machine as on the anvil. The Ajax universal forging machine not only compresses the dies, but has an independent vertical press that can be used for any operation within its capacity; also a punching device and a trimmer.

A variety of special forging machines are made for forming common articles, or parts required in large quantity. Many of them are named after the work they accomplish. The hot-pressed centre-feed nut machine is simply a small forging machine designed for making nuts. Bolt-heading machines and bolt and rivet headers are other examples of special forging machines.

Pressed steel is made by great hydraulic presses at the steel works. Pieces requiring but slight shaping are pressed in the cold; more or less complicated forms are heated to a cherry red and then light-pressed. Modern railway steel cars are made in this manner. Armor plates are formed in hydraulic presses under immense pressures which are maintained for a considerable time.

CHARLES H. COCHRANE.

MACHINE GUN, a firearm of small calibre fitted with mechanism by which it may be fired successively with great rapidity. Two distinct classes have been developed: (1) That in which the firing is done by turning a crank by hand; and (2) an automatic form which utilizes the recoil of the gun, or a part of the force of the exploding charge to operate the firing and reloading mechanism. The first class has been practically abandoned. In the automatic class the first shot is fired by working a lever, and the gun then continues to fire until the ammunition is no longer supplied — leaving the gunner free to give his whole attention to the aiming of the gun.

As to the relative merits of the two existing types of the automatic machine gun, expert opinion is divided, with perhaps a preponderance in favor of the gun operated by the recoil, as a technically better design: the recoil has to be provided for in any case and is thus made to do necessary work. In this type the breech block is separated from the barrel and linked to it by multiplying cam levers. The recoil is taken up and partly stored by a powerful spring, which thus becomes the source of the

other movements — which eject the empty shell, bring a new cartridge into position, insert it in the firing chamber of the gun and explode it; this cycle continuing as long as there is a recoil to keep up the energy. In the gun operated by the gas pressure of the discharge, a very small channel leads out of the interior of the gun barrel, and this is opened to the pressure of the explosion gases as the bullet passes. In some guns the gas is taken from very near the firing chamber; in others it is taken near the muzzle just before the bullet leaves the gun. In both cases the channel leads to a piston which is thrust backward by the force of the explosion against a powerful coiled spring, which stores a part of the energy and returns the piston to its original position the instant the pressure is released by the bullet leaving the muzzle. In this type of gun the recoil is taken up by a buffer spring which does not do any work. The amount of force taken from the propelling gases of the explosion is so minute as to be negligible, especially when it is taken from close to the muzzle, when the bullet has acquired its full velocity. It may be added that both methods work perfectly. The Maxim, Schwarzlose and Browning guns are operated by the recoil; the Colt, Hotchkiss and Lewis guns and the Browning rifle by explosion gases.

The great mechanical difficulty to be overcome in a machine gun is the heating up of the barrel due to the rapidly recurring explosions, the cumulative effect being so to expand the barrel that the rifle grooves no longer grip the bullets, which fly out helter-skelter as from a smooth bore, falling to the ground after a very short flight. Two methods of keeping the gun cool while in action have been utilized: air-cooling and water-cooling. In the former, thin "fins" of metal are affixed to the gun barrel so as to expose a comparatively very large surface to the air which is expected to disperse the heat by radiation and convection. When the air is moist this device is quite successful, but the drier the air the less it absorbs the heat and the quicker the gun will go out of commission. In practice it has been found that an air-cooled gun cannot be fired continuously for longer than three and one-half minutes, when it must be allowed to cool down, or another barrel must be substituted. Tests have shown that 7,000 rounds fired without respite will destroy the gun barrel; but if the firing it stopped at the end of two minutes, and the gun cooled, the same barrel will fire 50,000 shots before a new one need be put in. On aircraft, however, the air-cooled gun never gets overheated owing to the swiftness of the passage through the air and the generally cooler air currents in which the aircraft move. Special mention may be made here of the Lewis gun, which is air-cooled in an unusual fashion. The aluminum "fins" in this gun lie lengthwise along the barrel and are about two inches in depth. The whole is encased in a shell of light steel; thus forming a jacket of 17 air channels open at both ends. When the gun is fired the explosion acts so as to draw air from the end next the breech through these air channels at a speed of 100 feet per second, proving a thoroughly effective cooling device. The Colt gun is so contrived that a puff of air is sent through the barrel after each shot.

In the water-cooled guns the barrel is encased in a jacket filled with water, and the heat generated by the explosions is absorbed in the heating of the water to the boiling point (which takes but two and one-half minutes) and keeping it boiling. The steam is led by a flexible tube into a reservoir of cool water standing on the ground beneath the gun, and is there condensed. The water from this reservoir is used to replenish the supply in the jacket as it boils away. The Maxim, Gardner, Schwarzlose, Vickers and Browning machine guns are water-cooled. When used in aeroplanes however, water jackets are not needed, and are removed, the stripped guns operating satisfactorily as air-cooled guns. The water-cooled guns show greater endurance than the air-cooled type. The Schwarzlose (Austrian) gun, which is essentially a modified Maxim, is notable as having fired continuously 35,000 rounds before the mechanism required repair. The Browning gun at its official trial fired 39,500 rounds continuously after having fired 20,000 rounds and been cooled down, before the mechanism gave out. Most machine guns have their ammunition arranged in pockets of belts made of fabric, with 250 cartridges on each belt. A few types have the ammunition attached to metal bands, from 25 to 30 cartridges to each band. The Lewis gun carries its cartridges in a drum-shaped magazine. Formerly the machine gun was mounted on a gun carriage, but a stout tripod is now preferred and the gun is normally placed so as to be about two feet from the ground. The common method of transporting it is by pack-horse, though in the Great War these guns were usually carried on automobile trucks to the nearest point possible and carried by hand or dragged on a sled-mounting to the position where they were to be used. The German machine gun has a stand with four legs which may be extended like the poles of a stretcher, and the gun thus carried by two strong men, in case of emergency and easily by four men. Some types have adjustable skeleton wheels.

The principle of the machine gun has been applied to weapons of larger than rifle calibre and with a measure of success. The Maxim "pompom" or 37-millimetre gun throws one-pound shells at the rate of 300 per minute. The Hotchkiss gun is also made for one-pound shells. The Maxim combination automatic nine-pounder gun fires 60 shots per minute, but cannot be aimed at this speed. It is arranged to fire also as slowly as desired.

The machine gun is regarded from a tactical point of view as an infantry gun — as distinguished from artillery. That is, its effect is that of concentrated infantry fire. It is considered as equivalent to 100 riflemen, is far more easily concealed and is much more effective, due to the elimination of the human factor. It can deliver a sweeping fire over a wide front, or a concentrated fire upon a small area. While it is wasteful of ammunition, the effect of machine gun fire is peculiarly demoralizing to troops in the field. It is primarily a defensive weapon most useful in stopping advancing forces; but, given the attainment of a commanding position, it is supremely effective in putting hostile artillery out of commission. It is of comparatively little use against an enemy in line directly in front, but is invaluable in

enfilade. For this reason machine-gun emplacements often occupy salients, and have loopholes that open obliquely. In the field the machine guns are moved forward with the attacking troops to hold the ground won in an advance and are often useful in firing over the heads of a force advancing to an attack. It is effective up to 2,800 yards. As used in aeroplanes it sprays solid formations and supply trains on the march with a most deadly and demoralizing fire, besides being the chief weapon in air battles.

In 1917 the Maxim gun was in use by the armies of Great Britain, Russia, Italy, Spain, Portugal, Norway, Sweden, Holland, Turkey, Greece and most of the countries of South America; the Hotchkiss gun in France, Japan, Spain and Portugal; the Schwarzlose gun in Germany, Austria and Bulgaria. Norway, Sweden and Denmark also used the Madsen automatic rifle. The Browning guns of both light and heavy types were introduced in 1918 in the United States army and Lewis automatic rifles in the navy and the aeroplane service. The Lewis rifle is used also by the armies of Great Britain and France.

History.— The first machine gun to be produced was the Gatling gun, invented by Dr. R. J. Gatling of the United States. It had 10 rifle barrels arranged in the form of a hollow cylinder and was fired by turning a crank. The several barrels were discharged in succession, and delivered 500 shots per minute, scattered over the field at any angle. As each barrel fired only one shot out of 10, there was no difficulty from overheating. This gun was adopted by the British army in 1875. The Gatling gun was followed by the Gardner gun which had fewer barrels and in the latest type had two barrels encased in a water jacket. The Nordenfelt gun was the next (1878), and worked on the same principle as the Gatling. In 1885 Hiram Maxim first exhibited his automatic machine gun, and this was followed by the Hotchkiss gun. The chief differences were that the Maxim gun was water-cooled and the Hotchkiss air-cooled, and that the former operated by the recoil, and the latter by gas pressure. The Colt machine gun followed. In 1906 the Schwarzlose gun created a sensation. It was modeled upon the Maxim gun, but remarkably simplified. The Lewis gun, or, more correctly, automatic rifle was adopted by the British army in 1909. It weighs 25¼ pounds, and can be fired from the shoulder. Its magazine holds 49 cartridges. The Madsen automatic rifle is similar in type, but weighs only 15 pounds, and its magazines hold from 20 to 30 cartridges. In 1916 the Browning guns were invented especially for the United States army. The Browning automatic rifle resembles closely the Madsen rifle in appearance, weighs 15 pounds, and its detachable magazines carry generally 20 rounds although special magazines holding 40 rounds are also provided. The Browning machine gun resembles the Colt gun in some respects, and the Schwarzlose gun in others. Its ammunition is carried in belts holding 250 cartridges, which feed into the gun from a box mounted above the tripod. The Browning gun can be stripped of its water-cooling jacket for aeroplane work, and in that form weighs only 22½ pounds.

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RICHARD FERRIS.

MACHINE GUN TACTICS. Machine guns are preferable to infantry whenever fire alone is sufficient for the purpose. Infantry is indispensable when both fire and movement are required. The machine gun delivers a very effective grazing fire up to 900 or 1,000 yards; its fire is effective upon important targets at ranges over 1,100 provided the range is accurately estimated. The two chief uses of machine guns are in flank fire and surprise fire. The sheaf of bullets is dense and deep, but narrow; its maximum effect will be obtained upon a target having a narrow front and considerable depth — for example, a thin line taken in flank. It should be the rule to employ machine gun fire in a direction parallel to the probable front of the enemy; that is to say, in flanking positions. The sweeping movements should be employed in firing frontally on a thin line, but its density then becomes insufficient and its effectiveness is small. The machine gun is easily concealed; it should be kept out of sight and neglect targets of little importance; it should deliver bursts of fire which will come as a surprise; in this manner it may gain important results.

Any commander who has a machine gun and who uses it only to reinforce his firing line makes use of only part of the power at his disposal. He uses his machine gun to the best advantage in flanking positions, and he should select in advance several positions from which the machine gun can be used under various conditions, depending upon the probable course of the action.

In trench warfare machine guns are ordinarily grouped in platoons, detached from the company and posted in strong positions. If the enemy is preparing for an attack he makes special efforts to destroy the machine guns. Fortify them strongly, screen them from view and echelon them in the direction of depth. Machine gun positions without overhead cover are to be invariably rejected, unless they have been concealed from the commencement of the operation of entrenching. Gun pits with strong overhead cover cannot be used, on account of their relief, unless they are screened by favorable conditions, such as being on a second slope, by woods, underbrush, etc. Positions of low relief and well concealed should be prepared instead and nearby shelters should be dug from which the men of the gun detachment can come quickly to the gun. The gun positions may be pits dug in the form of howitzer shell funnels, in front of the trench, and connected with the shelter by a tunnel. The number of these positions should be increased and access provided to them by sheltered and concealed trenches, and firing frequently from positions which are to be used in repulsing attacks should be avoided. All of the machine guns should not be exposed at one time to the danger of being destroyed by placing them all in the first line.

It is best to echelon them beforehand and distribute the greater part of them between the line of supports and the lines of reserves, in order that they may be able to crush an enemy who has penetrated the first-line trench at the conclusion of a bombardment or of an attack with asphyxiating gas.

In no case should a machine gun detachment abandon its post; if need be it will permit itself to be besieged there and will defend itself to the last. The tenacity and heroism of a few machine gun men has often enabled the retaking of lost positions. To make it possible for them to do this, place the machine gun in a small earthwork, surrounded by well-hidden wire entanglements, and provided with several firing positions and furnished with food and water and an abundance of ammunition.

In manœuver warfare the machine gun company often fights as a unit and is frequently placed near the head of the column behind the security detachments in order to support the infantry at the beginning of the action. When it has no special independent mission the machine gun company should be placed at first under the orders of a battalion commander, who may assign one or more platoons of it to companies. In manœuver warfare machine guns are used in pits without head cover. On the offensive machine guns deploy with the advance guard and cover the deployment of the main body; they reinforce lines temporarily halted; and gain time for a preparation for continuing the advance; they assist in the artillery preparation with rapid and concentrated fire, and take the place of artillery in a very rapid pursuit or in completing a victory; they advance on the flank of a body of troops in an attack, and cover their flank from the counter attack which will probably be made against it; and they cover with fire intervals which have been left intentionally or accidentally between two units of the attacking line. On the defensive they provide along the front several successive barriers of flanking fire, which can be opened instantly by day or by night.

Generally speaking, there are two kinds of machine gun tactics: the tactics of long range, rendered possible by the conditions of the entrenchment battle, and the tactics of medium and short ranges, which have their place in the manœuver battle in the open, and the assault during the entrenchment battle. Long range fire is rendered practicable and effective in the entrenchment battle by the fact that the enemy's position is fixed and easily defined. Systematic aerial reconnaissance renders it possible to map out most accurately the position of the advanced trenches which form the enemy's firing line, the trenches farther back, where he keeps his supports and reserves, and the lines by which these supports and all supplies of ammunition must be brought up to the advanced trench. Reconnaissance of the enemy's position can reveal the areas where it is vulnerable to machine gun fire, and this fire can be directed on these areas with certainty. Thus the fire from the guns harass the enemy, impede his movements and inflict loss upon him.

It is obvious that the longer the range the more chance there is of selecting lines of trench that are open to enfilade. The machine gunner can pick out lines of trench far away to the right or left, on which he can bring diagonal indirect fire. The beaten zone is so moderate in extent that several guns have to be used together to sweep a given extent of ground either in frontage or depth, though the single section of two or four guns is sufficient when firing on a narrow target, such as a communication trench.

Machine guns effectually cover the reorganization or retirement of the infantry they are supporting. Some guns are used to create a screen of fire between the infantry and the enemy; others use high angle fire against the reserves which the enemy is bringing up for the counter attack. In a prolonged retirement a rear guard should be well provided with machine guns. The approved plan is to divide the machine gun force into two portions, one of which is in action while the other is taking up a second position farther to the rear.

In the case of cavalry against cavalry, the action of machine guns is analogous to that of horse artillery. They must endeavor to take up a flank position, from which they can bring their fire to bear upon the enemy's cavalry while their own cavalry is advancing to the attack. The guns have to provide for their own protection, and be able to take up a position where they are practically safe from mounted attacks. Armored cars have provided a new field for machine guns. As a rule the heavier type of car, in which the gun is permanently mounted in a kind of turret, operates on the roads. It gives invaluable support to patrols and detached parties, the men working the gun being themselves fairly safe from rifle and machine gun fire. The drawback of the car is that it is rather a prominent target for artillery. In another type the gun is merely carried up by the car and is then taken out and placed in position.

Motor machine guns are successfully used to close a gap in a line or support troops who are rapidly driven in. In covering a retreat along a good road, they are invaluable. Their normal work, however, is to support patrols and advanced parties, and to operate against enemy patrols. To sum up, (1) machine gun fire should be used liberally to save the infantry, (2) it should be used from flanking positions, (3) the machine guns should be concealed in order that their fire may come as a surprise, and (4) they should be echeloned in depth and sheltered to prevent their being destroyed early in the action.

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Consulting Military and Civil Engineer.

MACHINERY-MANUFACTURING INDUSTRY IN AMERICA. Owing to the restrictive measures of Great Britain this industry made a late start in America; but when a beginning was made, the very laws by which the mother-country sought to make the States dependent on her proved more stimulating to the development of our machinery-manufacturing industry than the most rigid system of protective tariff would have been. Great Britain wished to confine manufactures to her shores and compel the American colonists to buy their manufactured articles from English factories. At first the colonists were not allowed either to manufacture or to import machinery. In the year 1774 a statute was enacted by Parliament instituting the restrictive system as to textile machinery. This statute was made more strin-

gent in 1781, and it was not actually repealed till 1845. This act prohibited the exportation of "any machine, engine, tool, press, paper, utensil, or implement whatever, which now is, or may at any time be, used in or proper for the preparing, working, pressing, finishing, or completing of the linen, cotton, wool or silk manufactures of this kingdom, or any other goods wherein wool, silk, or cotton is used, or any part of such machine, etc., or any model or plan of any such machine," under penalty of forfeiture of the tools or machine, the payment of a fine of £200 and imprisonment for one year. Further, foreigners were prohibited, under a penalty of £500 and imprisonment for 12 months, "from seducing artificers, and others employed in the manufactories, to depart out of this kingdom; and if any artificer has promised or contracted to go into foreign parts to practise or teach his trade, such artificer may be obliged to give security, at the discretion of the court, that he shall not go beyond the seas, and may be committed to prison until he give such security."

These laws were rigidly enforced; and it was seldom that they were evaded. It was impossible even to smuggle a textile machine into this country; and the models that were surreptitiously imported were imperfect. Tench Coxe, the coadjutor of Alexander Hamilton in the Treasury Department, made arrangements to have models of Arkwright's patents sent to him; but before they could be shipped they were detected and forfeited. In 1786 the General Court of Massachusetts appointed a joint committee to investigate textile machinery; and this led later to the employment of Samuel Slater and to the real beginning of machinery-manufacture in this country. Slater landed at New York 17 Nov. 1789; and in the following January he made arrangements with Messrs. Brown and Almy, of Providence, R. I., to construct for them textile machinery on the English plan. He made most of the machinery with his own hands and set it up at Pawtucket, R. I. This was the first textile mill in this country to use the Arkwright system. It was opened 20 Dec. 1790. It must be remembered that Slater brought with him from England no implements to work with, and no plans or models. He had to depend entirely upon his memory. Alexander Hamilton called him "the father of American manufactures"; but, in the first place, he was the father of American machinery. Up to the time of his coming there were no machines in this country, with the exception of the rude saw-mill, grist-mill and fulling-mill; some rolling and slitting mills, foot-lathes, and a few home-made carding and spinning appliances. The first carding-machine worked in the United States was constructed at Newburyport, Mass., in 1793, by John and Arthur Scofield. Until then the household looms were the only domestic source of supply of woolen cloth.

At this time the manufacture of metal working machinery was in its infancy. The lathe was known only in its simplest form, i.e., two dead centres supporting the work as it was rotated backward and forward by a band around it, one end attached to a spring-pole above it, the other end to the foot of the operator, who held the turning-tool in his hand. Even after the lathe had been provided with a revolving spindle and centre to support and rotate the work, the tools used for turning both wood and iron were still manipulated by hand. The increasing demand for accurately-cut cylindrical iron pieces, which could not be made by hand, led to the general use of the slide-rest. Formerly used only by the optician and the maker of mathematical instruments, it now became a necessary adjunct of the mechanic's lathe. This gave the lathe practically unlimited capacity to turn out exact cylindrical work; but in order for the slide-rest to do its work, it had to be manipulated by the workman. The next step was naturally the introduction of the slide-lathe, by which the rotation of the work and the advance of the cutting tool are accomplished automatically. Owing to the lack of suitable tools to make the long flat surfaces required in such a machine, the slide-lathe had a curious development. The hammer, file, cold-chisel and straight edge were the only tools at hand. The planing-machine was the development of a demand for greater accuracy in the slide-rest. It worked an era in the life of the machinist as great as that of the slide-rest itself. It is doubtful when the first planing-machine was made in the United States; but we know that there were only four such machines in this country in 1838. With this machine the rough and uneven surfaces of castings could be smoothed and reduced to true planes. Up to this time the drill had been limited to a revolving vertical spindle. The boring-mill or vertical lathe was now possible and took its place in the machine-shop for the execution of a large class of turned work that did not require to be supported on centres, such as wheels to be keyed upon their shafts. In fact, the first development of the planing-machine was the key-seating machine. It was soon recognized that such a machine could be turned to other work, and further changes were made accordingly. It was provided with compound slide-rests, with a revolvable table mounted thereon and in this form it took its place as a standard tool in the machine-shop under the name of the slotting-machine. This planer, with its vertically movable tool, was the progenitor of a machine with similar attachments, but with its tool moving horizontally, upon which work could be conveniently shaped in a great variety of forms; and the shaping-machine, as it was called, soon became one of the standard tools of the machine-shop. Meanwhile, the old vertical spindle drill, with its compound tables, movable vertically and adjustable horizontally, in two directions at right angles with each other, had been supplemented by the horizontal drill, with similar tables, but with its drill-spindle parallel to the tables; and the further requirements in this direction had been supplied by the radial drill, in which the vertical drill-spindle is movable about a vertical axis, to which it is adjustable radially.

However, there were other factors entering into the development of our machinery industry. There were other requirements beside these machine-tools, and which these supplied inadequately. Screw-bolts and nuts were needed for putting the machines together. Originally iron screw-bolts had been made by means of a split die provided with spiral threads, by rotating either the bolt or the die backwards and forwards until the thread was partly cut, while a

taper-tap was screwed into the nut first from one side, then the other, until the bolt was found to fit into the nut. These bolts were not interchangeable. This primitive system of bolt-manufacture continued until 1847, when the solid die with sectional threads patented by Phiietus W. Gates was generally introduced. This die cut the thread at one pass, then the rotation was reversed to unscrew it from the bolt, which marked the thread and was liable to mutilate the die. No compensation for wear was possible. Nothing approaching perfection was attained until 1857, when William Sellers devised a bolt-machine in which dies to cut the thread at one pass, and adjustable to size, could be opened and closed while running continuously in one direction. Since then ordinary screw-bolts have been made interchangeable. In a few years this machine of Sellers' was introduced into England and also continental Europe. The first turret lathe was built by Stone in 1854. It was provided with automatic mechanism for turning the turret in 1855, and perfected to its present condition in 1858. The gear-cutter was another of the early machine-shop tools. This was simply a revolving milling-cutter, mounted upon a spindle above the dividing-plate. The wheel to be cut was forced against this. The machine was adjusted by hand. Such work was slow and very expensive; and up to 1867 the teeth of nearly all wheels, even for fine machines, were cast. In this year a machine was devised by William Sellers which limited the work of the operative to adjusting the wheel to be cut to the cutter. The machine was otherwise automatic; and it was now possible for one workman to attend to several machines, thereby greatly diminishing the cost of such work. From that time cast wheels have been no longer allowable in first-class machines. Another typical machine-tool that deserves mention is the milling-machine. It has received its greatest development in this country. The manufacture of metal-working machinery has become highly specialized, and only the older establishments produce a number of different types of machines. New establishments usually make only one type of machine, or at most one class embracing tools of similar type. Some establishments make only engine-lathes, others only planers, others nothing but milling-machines. The effect of specialization has been to make machine-tools more efficient, and, it may be added, more varied. If, for instance, a new construction is designed, as in the automobile, or airplane, and strangely fashioned parts are required, a machine that will make these parts is always forthcoming.

The development of more accurate machinery, as indicated above, led to the system of interchangeability. In the manufacture of machinery this is an economic principle of the greatest importance. Under more primitive methods individual parts had to be fitted together with great difficulty and at much expense. Now all these parts are made by machines with such exactness that they are completely interchangeable; and there is no longer any question as to their fitting. This method of manufacture has increased the output of the individual workman and reduced the cost of production tremendously. Though first applied in Europe, it remained for the United States to demonstrate its feasibility and actually put it into successful operation, and it is generally referred to as the American system. For the economical manufacture of any kind of machinery in which many parts are to be interchangeable certain definite conditions must be met; and success economically requires that every part shall be finished without the intervention of a skilled workman. The machine must be so designed that it will not only work automatically but work with a high degree of accuracy. Reference standards must be provided with which to compare the several parts in order to determine the amount of variation permissible between the standard and the produce; every part must come from the machine in the final finished form. Such are some of the details that make necessary a careful study of every part in order to design a machine that will perform each operation with the most efficiency.

The principle of interchangeability was first suggested and put into operation in a small way by Le Blanc, in France. Its importance and possibilities were at once recognized by American inventors, and its first application in the United States was in the manufacture of fire-arms in our government arsenals under the direction of Eli Whitney, the inventor of the cotton-gin. Simeon North, a maker of pistols, and a neighbor of Whitney, also adopted the system. By 1818 both of these men were using drilling and filing jigs. The growth of the system was slow, being confined for a time to the principal parts; but even in this undeveloped condition it proved successful economically. In 1822 Calhoun, who was then Secretary of War, remarked to Whitney that his improvements were saving the government $25,000 a year at the two public armories. The drop-hammer and dies were first used by Hall, at Harper's Ferry in 1827. Whitney adopted this machinery and thus was able to cut from red-hot metal all the smaller parts of a gun in a form closely approximating the finished article. These forged parts were then subjected to the more accurate milling-machine, which turned out the parts in uniform condition, no matter how varied their shape may have been when they came from the forging-press. It only remained for the drill to fashion the bearings for the working parts and bore the holes to secure the parts together. This was a comparatively simple matter when once the order of procedure had been determined and the guiding templets or jigs provided. The wooden stocks of the gun were also made by machinery and with sufficient accuracy to make them interchangeable. This was accomplished by means of a turning-lathe designed by Thomas Blanchard and patented by him in 1820. After the stock came from the lathe the groove for the barrel and the cavity for the lock were hollowed out by special machinery. Measured by the standards of to-day all this work was crude; but the gun of that day was itself crude, and these roughly interchangeable parts served their purpose. Machine-tools were then both inaccurate and limited in variety, so that they could not be expected to turn out the various parts with mathematical accuracy. Further, at that time there were no such delicate measuring instruments as we have to-day. The most refined measuring instrument known then was the vernier caliper; and the smallest deviation from the standard that could

be detected with this contrivance was, at best, perhaps the thousandth part of an inch. In 1848 the interchangeable system was applied to watch-making at the Waltham factory, and in 1850-51 it was adopted for sewing-machines. The profiling machine was developed between 1848 and 1852 by F. W. Howe and E. K. Root. Since then have come great developments in the quality of machine-tools and in their wonderful adaptability to changing needs. Measuring instruments have now been so highly developed that a variation of the twenty thousandth part of an inch can be detected immediately and with perfect accuracy.

Foreign countries did not remain indifferent to the success of the United States in the employment of the principle of interchangeability of parts. Various commissions were appointed to investigate the system; and, as remarked above, the economic success of the United States in producing interchangeable parts led to the adoption of this method in Europe. In 1854 the Colt factory was established at Hartford, and shortly afterward a British commission bought from them a full outfit of machinery for making the Enfield rifle on the interchangeable system. Between 1870 and 1880 our large machinery manufacturers were kept busy filling foreign orders, especially for gun machinery. Large orders for such machinery were received from the German government; and it was even stipulated in the contract that the manufacturers should send over men to set up the machinery and instruct native workmen how to run it. Other governments began to look to us for their machinery; and thus our system for the manufacture of interchangeable parts was gradually established in England and continental Europe. This principle of interchangeability, first applied to the manufacture of fire-arms, then to pistols, has now been extended to practically every kind of machine. The sewing-machine, the typewriter, the bicycle, the watch, the various kinds of agricultural machinery, the gasoline engine, and notably in the automobile, may be mentioned as types showing the economic value of the principle of interchangeability. All our large machinery manufacturers are represented in foreign countries, and certain types of American typewriters, sewing-machines, cash registers, mowing-machines, reapers, etc., are just as well known there as they are here. American textile machinery and shoe-making machinery play an equally important part.

It is impossible to give statistics for our machinery-manufacturing industry as a whole, since, with a few exceptions, the United States census does not separate it from foundry and machine-shops in general. The following figures from the Special Census of Manufactures taken in 1914 afford the best available survey of the present condition of the machinery-manufacturing industry in the United States. Of the 17,027 establishments included as foundries and machine shops, 10,640 are grouped as making machinery of some sort. These shops operated in the year, quoted with a combined capital of $1,246,042,694, and with 564,610 wage earners, who received in that year $244,146,380 in wages. The value of the product amounted to $866,544,677, of which $508,422,896 was the value added by manufacture. In the following table is given the number of establishments making the machinery named, and the aggregate value of the output in 1914.

549 internal combustion engines	$54,250,421
33 steam locomotives	39,043,359
409 machine tools	31,446,660
243 steam engines not locomotives	30,498,638
211 textile machinery	30,437,689
298 pumps and pumping machinery	27,456,916
280 mining machinery	23,823,117
48 sewing machines	21,710,643
53 typewriting machines	20,516,532
213 elevators and mechanism	17,228,101
277 metal-working machines	17,419,526
19 cash registers	15,935,067
44 adding and calculating machines	14,731,455
378 wood-working machines	13,392,900
78 dairy machinery	12,998,374

The manufacture of electrical machinery is also very large and of great aggregate value, but no separate figures are available, the census grouping the machinery of this class with electrical apparatus and supplies.

By far the largest group of all is the agricultural machinery. In this case also the census fails to separate the machines from the tools — such as spades, rakes and ploughs. However it is certain that by far the greater values are in the drills; the mowing, reaping and binding machines and other harvesters. The figures as given for this industry in 1914 are as follows: 601 establishments reported a capital aggregating $338,531,673; and the value of their product for the year was $164,086,835, of which sum $90,578,190 was added by manufacture.

The exports of American machines and machinery in 1914 amounted in value to $91,818,664, to which should be added most of the value of agricultural implements exported, $10,304,978, a decrease owing to the war from $31,965,789 in 1913.

Since the beginning of the European War the exports of other types of American machinery have enormously increased. This increase has been most remarkable in the case of metal-working machinery. In 1913, the latest year in which the figures can be regarded as quite normal, the exports of such machinery were valued at $16,097,315. By 1916 they had risen to $61,315,032. Steam locomotives exported in 1913 were valued at $6,442,674; those exported in 1916 at $12,665,877. The export values of electrical locomotives, automobile engines, marine engines and sugar-mill machinery also show an increase of 100 per cent between the two years quoted.

See HARDWARE INDUSTRY; FARM MACHINERY; and articles on special types of machinery.

MACHPELAH, măk-pē'lą, **Cave of,** Hebron, Palestine; in Old Testament history the burial place of the patriarchs. Upon the traditional site stands a superb mosque which only Mohammedans are permitted to enter, although by a special firman of the sultan the Prince of Wales visited it in 1862, the Marquis of Bute in 1866 and the Crown Prince of Prussia in 1869.

MACHRAY, mą-krā', **Robert,** Canadian Anglican archbishop: b. Aberdeen, Scotland, 17 May 1831; d. Winnipeg, Canada, 9 March 1904. He was graduated at King's College, Aberdeen, in 1851, and from the Sidney Sussex College, Cambridge, in 1855. He was of Presbyterian stock, but joined the Church of England and was ordained deacon in 1855 and priest in 1856.

He was appointed vicar of Madingley, near Cambridge, in 1862, and in 1865 he was Ramsden preacher at Cambridge. He was appointed bishop of Rupert's Land, Canada, in 1865, and was consecrated in May of that year. His diocese covered 2,000,000 square miles of territory with headquarters at the then hamlet of Winnipeg, and but 18 clergymen to assist him. He was active in the promotion of education, renewed and reorganized the defunct Saint John's College at Winnipeg, and himself lectured in ecclesiastical history, liturgiology and mathematics. He was one of the founders of Saint John's Ladies' College; and upon the establishment of the University of Manitoba in 1877 he became chancellor, retaining the office until his death. He had meantime organized his diocese with a view to serving the fast increasing population. He became metropolitan of Canada under the primacy of the archbishop of Canterbury in 1875, and upon the union of the Canadian Anglican churches, in 1893, he became archbishop of Rupert's Land and primate of all Canada. Consult Machray, Robert, 'Life of Archbishop Machray' (1909).

MACHUELO, mą-chwā'lō, Spanish name current in the West Indies for the thread herring (q.v.), an inedible, shad-like fish (*Opisthonema oglinum*) of the Atlantic coasts of the United States and the waters of the West Indies.

McILHENNEY, Charles Morgan, American landscape painter: b. Philadelphia, 4 April 1858; d. 1904. Having studied under Frank Briscoe, he continued his training at the Academy of Fine Arts in Philadelphia, and soon began to win recognition in his chosen field. Among his best-known works are 'A Gray Summer Noon' (1884), and 'The Passing Storm' (1887); 'Old Friends' (1891); 'On the Beach' (1891); 'Grey Morning' (1892); 'September in the Marshes' (1893). In 1893 he was awarded medals at the Columbian Exposition and won the first Hallgarten prize.

McILVAINE, mäk'īl-vān', **Charles Pettit,** American Protestant Episcopal bishop: b. Burlington, N. J., 18 Jan. 1799; d. Florence, Italy, 13 March 1873. He was graduated at the College of New Jersey (now Princeton University), in 1816; entered the Princeton Theological Seminary in the same year, and was ordained deacon in 1820 and priest in 1821. His first pastoral charge was at Georgetown, D. C., which he left in 1825 to become professor of ethics at the United States Military Academy, West Point. He became rector of Saint Ann's Church, Brooklyn, in 1830, and in 1831 undertook the duties of the professorship of the evidences of religion and sacred antiquities in the New York University. He did not long hold the chair, however, as he was the next year elected bishop of Ohio, to succeed Bishop Chase, who had resigned the see. The question of the legality of such a resignation excited considerable interest in the General Convention of that year, but in the interest of the diocese both houses agreed in approving Dr. McIlvaine's testimonials, and he was accordingly consecrated in Saint Paul's Chapel, New York. Upon his removal to Ohio he was elected president of Kenyon College, Gambier, founded by Bishop Chase, and held the position until 1840, acting also for some years as president of the theological seminary in the same place. During his long episcopate he came to be recognized as one of the most influential leaders of the Evangelical or Low Church party in America, and his ability and courtesy were cordially recognized by those who differed from him most widely. During the Civil War he was one of the four ambassadors informally appointed by President Lincoln to set before the English people what was considered in the North the real significance of the War. He published various sermons, addresses and more important theological works, mainly directed to defending the positions of his party in the Church.

McILWRAITH, mäk''l-räth, **Jean Newton,** (JEAN FORSYTH), Canadian author, daughter of Thomas McIlwraith (q.v.): b. Hamilton, Ontario, 1871. She was educated at Ladies' College, Hamilton, and studied English literature in the correspondence classes of Queen Margaret College, Glasgow, for 10 years, engaging in editorial work in New York in 1902. She is a frequent contributor to magazines and is author of 'A Book About Shakespeare' (1898); 'History of Canada' in 'Children's Study Series' (1899); (joint author with William McLennan) 'The Span o' Life' (1899); 'The Curious Career of Roderick Campbell' (1901); 'A Diana of Quebec' (1912), etc.

McILWRAITH, Thomas, Canadian ornithologist: b. Ayreshire, Scotland, 1824; d. 1903. He was educated in Scotland and emigrated to Hamilton, Ontario, in 1853, where he spent the remainder of his life. He became known through his classification of the birds of Canada and his study of their habits, which subject he pursued as a recreation. He was a member of the conference of American ornithologists held in New York in 1883, out of which came the American Ornithologists' Union. He served for many years as superintendent of the district of Ontario for the Migration Committee of the American Ornithologists' Union. His first report of Canadian birds was published in the *Canada Journal* in 1861, and his 'Birds of Ontario' was published by the Hamilton Association (1886; author's ed., 1887; 2d ed., 1894).

McINTOSH, Lachlan, American soldier: b. near Inverness, Scotland, 17 March 1725; d. Savannah, Ga., 20 Feb. 1806. He came with his father to Georgia in 1736, received there an ordinary English education, became a clerk in the mercantile establishment of Henry Laurens at Charleston, S. C., and was later employed as a land surveyor. At the opening of the Revolution he was made colonel of the 1st Georgia battalion, and became a brigadier-general in 1776. In 1777 he fought a duel with Button Gwinnett (q.v.), who was fatally wounded. In 1778 McIntosh was selected by Washington to lead a small force against the Western Indians, whom he subdued. In the siege of Savannah, 1779, he bore an active part. When Charleston surrendered to Sir Henry Clinton 12 May 1780 McIntosh was taken prisoner, and he never resumed his command. He was a member of the Continental Congress in 1784, and the next year as commissioner to the Indians he finished his public services.

MacINTOSH, William, a half-breed Creek chieftain, son of a Scottish trader: b. about 1780; d. 1 May 1825. In 1802 the United States undertook to extinguish the Indian titles to

lands within the borders of Georgia and in 1805 millions of acres of Creek lands were transferred to Georgia. The Creeks becoming alarmed at the prospect of being deprived of all their lands, on the motion of MacIntosh, now a chief, made a law in general council in 1811 forbidding the sale of any of the remaining land under penalty of death. MacIntosh led the Creek allies of the Americans in the War of 1812 with the rank of major and took the chief part in the massacre of 200 hostile Creeks at Atasi on 29 Nov. 1813. He also took part in the battle at Horseshoe Bend, Ala., 27 March 1814. More lands were acquired by treaty in 1818 and in 1821 another treaty was negotiated by the Georgians with MacIntosh, who was in the pay of the whites, and other chiefs controlled by him, while 36 chiefs refused to sign and demanded a general council. In 1824 about 10,000,000 acres still remained in the hands of the Creeks and in that year they re-enacted the law punishing with death any Creek who ceded land. In 1825 the whites, with bribes, induced MacIntosh and the chiefs under his control to sign a treaty ceding the remaining Creek lands. The treaty was approved by President Adams, but the Creeks did not rise in rebellion; they passed formal sentence of death on MacIntosh, which a party of warriors carried out.

MACK, Norman Edward, American politician and newspaper publisher: b. Buffalo, N. Y., 24 July 1858. He received a public school education, engaged in business and in 1879 established the *Buffalo Sunday Times*. In 1883 he began the publication of the *Daily Times*, of which he continues owner and editor. He was a delegate to the Democratic National Conventions from 1892, has served as a member of the Democratic National Committee since 1900 and became its chairman in 1908.

MACK VON LEIBERICH, Karl, Baron, Austrian military officer: b. Nennslingen, Bavaria, 24 Aug. 1752; d. Saint Polten, Austria, 22 Oct. 1828. He entered the army of Austria in 1770, and was in 1797 created field-marshal. After the peace of Campo Formio, he was appointed by the king of Naples to the command of his troops, and took the field against the French and occupied Rome; but a riot in Naples, caused by his having concluded an armistice with the French, forced him to take refuge in the French camp (1798). He was carried prisoner to Paris, but escaped in 1800 and in 1805 was sent to check the French advance alone the line of the Iller. But the enemy shut him up in Ulm, and on 17 October Mack capitulated with his army. He was tried by court-martial, but the sentence of death was commuted by the Austrian emperor to expulsion from the army and 20 years' imprisonment. In 1808 Mack was liberated, and in 1819 fully pardoned.

McKAY, măk-ī', **Alexander Charles,** Canadian educator: b. Beamsville, Ontario, 2 June 1861. He was educated at the universities of Toronto and Cambridge, England. He became professor of mathematics and physics at McMaster University in 1890, later holding the offices of dean of arts and registrar, and in 1905 he was elected chancellor of the university. Since 1911 he has been principal of the New Technical School, Toronto. He has collaborated in the preparation of mathematical textbooks.

MACKAY, mą-kā' or mą-kī, **Charles,** English poet, journalist and miscellaneous writer: b. Perth, Scotland, 27 March 1814; d. London, 24 Dec. 1889. He was editor of the *Illustrated London News*, 1852–59, lectured in the United States, 1857–58, and was a special correspondent of the London *Times* in New York during the Civil War (1862–65). He was famous for his songs, many of which he set to music of his own. 'Cheer, Boys, Cheer,' is the best known of these.

MACKAY, Clarence Hungerford, American capitalist: b. San Francisco, 17 April 1874. The son of J. W. Mackay (q.v.), he succeeded on the death of his father to his vast business interests. Much of his boyhood was spent in France, and he was educated at Vaugirard College, afterward studying at Beaumont College, Windsor, England. He is president of the Commercial Cable Company, the Postal Telegraph-Cable Company, the Commercial Pacific Cable Company, the Mackay Companies, the Commercial Cable Building Company, the Postal Telegraph Building Company and the Commercial Cable Company of Cuba. He is also a director of the North American Telegraph Company and the Metropolitan Opera Company. As treasurer of the Lincoln Farm Association, he was one of the prime movers of the effort to raise funds for the purchase of the log cabin in which Abraham Lincoln was born.

McKAY, Donald, American shipbuilder: b. Nova Scotia, 1810; d. 1880. He went to New York and learned shipbuilding, and began the business at Newburyport, Mass. At East Boston, in 1845, he established a shipyard where he built many large trading ships of the clipper model, in which he made great improvements. The *Great Republic*, which he built in 1853, a ship of 4,500 tonnage, was a larger vessel than had ever before been seen.

MACKAY, George Eric, English poet, son of Charles Mackay (q.v.): b. London, 25 Jan. 1851; d. 2 June 1898. Among his works are 'Songs of Love and Death' (1865); 'Ad Reginam' (1881); the popular 'Love Letters of a Violinist' (1886); 'A Lover's Litanies' (1888); 'Nero and Actæa,' a tragedy (1891); 'My Lady of Dreams' (1895); 'Arrows of Song' (3d ed., 1896); 'A Lover's Missal' (1898).

McKAY, Gordon, American inventor and manufacturer: b. Pittsfield, Mass., 1821; d. Newport, R. I., 19 Oct. 1903. He was the son of a cotton manufacturer, and at 12, on the death of his father, learned civil engineering, at which he worked for some time. Before he was 21 he built a machine-shop in Pittsfield which employed 100 men, and later became treasurer and manager of the Lawrence Machine Company. He was the first successful inventor of machinery for making boots and shoes; he perfected a shoe sewing-machine, invented, but not made practicable, by L. R. Blake, of Abington, Mass.; afterward invented the heeler, lasting-machine, nailing-machine, etc., which came into general use; and by these inventions revolutionized the boot and shoe industry of the world. At the outbreak of the Civil War he offered to make the shoes for the Union army, and within three years had leased his

machines to more than 60 firms, and shortly became a millionaire. In 1878 he formed the McKay Sewing-Machine Association, a strict monopoly which exacted commissions on all shoes made in the United States by the aid of his inventions, and also brought profit through European royalties. In 1893 he placed $4,000,000 in a trust fund for Harvard University. He made many other liberal donations for benevolent and educational objects, and established near Kingston, R. I., the McKay Institute for the manual training of colored youth. By his will the greater part of his estate was left to Harvard.

MacKAY, Jessie, Australian poet and prose writer: b. Cambridge, New Zealand, 15 Dec. 1864. She combined teaching with literary work and has been a voluminous contributor to the Australian press, with the readers of which she is a favorite. Among her published works are 'The Spirit of the Rangatira and Other Ballads' (1810); and 'The Sitter on the Rail and Other Poems' (1891).

MACKAY, John William, American capitalist: b. Dublin, Ireland, 28 Nov. 1831; d. London, 20 July 1902. His parents brought him to New York in 1840, and he learned shipbuilding. He went to California as a miner in 1851, and afterward to Nevada, where he continued mining with great perseverance in the face of many disappointments. In 1872 he was one of the discoverers of the Bonanza mines of the Comstock Lode (q.v.), in which mines he obtained a two-fifths share and became very wealthy. He and his partners, Fair, Flood and O'Brien, founded the Bank of Nevada, of which Mackay was president for years. His relations with Jay Gould being unfriendly, in a spirit of opposition to him, and to the Western Union Telegraph Company, Mackay in 1884 joined with James Gordon Bennett in forming the Commercial Cable Company and the Postal Telegraph Company. He succeeded in laying two cables, overcoming great obstacles, and afterward won in a long rate-war with the old lines. The Roman Catholic Orphan Asylum at Virginia City, Nev., founded by him, is noteworthy among his many public benefactions.

MACKAYE, mą-kī', James Steele, American playwright: b. Buffalo, N. Y., 1844; d. Timpas, Colo., 25 Feb. 1894. In 1868 he went to Paris to study painting; but having there met Delsarte (q.v.) became interested in the latter's theories, and studied dramatic expression. In 1870–71 he gave in New York and Boston lectures on the art of expression. He opened the Saint James Theatre at New York in 1872, and appeared there in 'Monaldi,' adapted by himself from the French. In 1873–75 he was studying the drama in Paris and England, and at the Crystal Palace, London, he played the title-rôle in 'Hamlet.' His adaptation of Blum's 'Rose Michel' in 1872 ran for 122 nights at the Union Square Theatre, New York. He established in New York the Lyceum School of Acting, which later became the American Academy of Dratmatic Arts. For several years he was manager of the Madison Square Theatre, and in 1885 built the Lyceum. Among his further plays were 'Won at Last'; 'Through the Dark'; 'Hazel Kirke'; 'A Fool's Errand'; 'In Spite of All'; 'Paul Kauvar.' Consult Mackaye, Percy, 'Steele Mackaye: A Memoir' (New York 1911).

MACKAYE, Percy, American dramatist and poet: b. New York, 16 March 1875. He was graduated from Harvard in 1897 and studied at the University of Leipzig in 1899–1900. He engaged in European travel in 1898–1900, residing in Rome, Switzerland, Leipzig and London. He was an instructor in a private school in New York in 1900–04, after which time he joined the Cornish Colony in New Hampshire and devoted his time entirely to dramatic work. He has lectured on the theatre at Harvard, Yale, Columbia and other American universities, and is a member of the National Institute of Arts and Letters. He is a leading exponent of poetic dramatic art in America and handles both tragedy and comedy with grace and surety of touch. Author of 'The Canterbury Pilgrims,' a comedy, produced by the Coburn Players in the open air at Harvard, Yale and other universities in 1909–13, and given as a civic pageant in honor of President Taft at Gloucester, Mass., 4 Aug. 1909 (1903); 'A Modern Rendering into Prose of Chaucer's Tales' (1904); 'Fenris the Wolf,' a tragedy (1905); 'Jeanne d'Arc,' a tragedy, produced by Julia Marlowe and E. H. Sothern in America and England in 1906–07 (1906); 'Sappho and Phaon,' a tragedy (1907); 'The Scarecrow' (1908); 'Lincoln Centenary Ode' (1909); 'Mater,' an American comedy (1908); 'The Playhouse and the Play,' essays (1909); 'A Garland to Sylvia' (1910); 'Anti-Matrimony,' a satirical comedy produced and acted by Henrietta Crossman (1910); 'The Civic Theatre' (1912); 'Uriel and Other Poems' (1912); 'Beauty and the Beast,' a lyric drama (1912); 'Sanctuary, A Bird Masque,' produced for President Wilson at Meriden Bird Club Sanctuary, New Hampshire (1913); 'The Immigrants,' a lyric drama (1915); 'The Evergreen Masque' (1917), etc. See SCARECROW, THE.

McKEAN, mą-kēn', Thomas, American patriot and jurist, signer of the Declaration of Independence: b. New London, Chester County, Pa., 19 March 1734; d. Philadelphia, 24 June 1817. He was privately educated at Newcastle, Del.; having settled there, he studied law and was admitted to the bar in 1755, at once became register of probate and was soon made assistant attorney for Sussex County. With Cæsar Rodney (q.v.), in 1762, he entered upon a revision of Delaware laws up to 1752, and was chosen in the same year to the Delaware assembly, in which his membership continued till 1779. Elected in 1765 to the Stamp Act Congress, he took a strong position in defense of colonial rights and as judge of the Common Pleas in the same year permitted no stamped paper to be used in his court. About 1771 he began to practise law in Philadelphia, although retaining a Delaware residence, and from Delaware, in 1774, he was elected to the Continental Congress, in which he served nine years, including the entire period of the Revolution, and took a prominent part in its proceedings, being president of the Congress in 1781. He was not present at the signing of the Declaration of Independence, which he had advocated, but added his signature some years afterward. The

Articles of Confederation, which he aided in drafting, were also signed by him. In Pennsylvania, where he had become well known, he was made chairman of the Committee of Safety in 1776, and from 1777 to 1799 was chief justice of the State. He became a strong supporter of Jefferson, and a leader of the Republican party of that day, and was governor of Pennsylvania from 1779 to 1808. With James Wilson he wrote 'Commentaries on the Constitution of the United States' (1790).

McKEAN, Thomas, American philanthropist: b. Philadelphia, Pa., 23 Nov. 1842; d. there, 16 March 1898. In 1862 he was graduated at the University of Pennsylvania and entered upon a successful business career, becoming an officer in many railroad and financial corporations. He acquired a large fortune, which he spent freely in endowing educational and charitable enterprises, his various gifts to the University of Pennsylvania alone amounting to $300,000.

McKEES ROCKS, Pa., borough in Allegheny County, on the south bank of the Ohio River, opposite Allegheny and three miles northwest of Pittsburgh, on the Pittsburgh and Lake Erie and the Pittsburgh, Chartiers and Youghiogheny railroads. There is an abundance of bituminous coal and natural gas in the district, and there are large iron and steel industries with their kindred smaller manufactories. The town ships lumber and there are manufactures of wall plaster and concrete. The land was originally conveyed to Alexander McKee in 1764, a settlement was formed in 1830 and the town was incorporated in 1892. There is a considerable foreign population. The town is growing rapidly. Pop. 14,702.

McKEESPORT, Pa., city, in Allegheny County, at the junction of the Monongahela and the Youghiogheny rivers, and on the Pennsylvania, the Pittsburgh and Lake Erie, the New York Central and the Baltimore and Ohio railroads, about 14 miles southeast of Pittsburgh. The first permanent settlement was made in 1795 by David McKee, after whom the place was named. It was only a small village until 1829, when coal mining began on an extensive scale. It was incorporated as a borough 1 Sept. 1842, and chartered as a city 1 April 1890.

McKeesport is situated in a region noted for its extensive fields of bituminous coal and its natural gas. The chief industrial establishments are steel and iron works, one of which, the National Tube Company, has 6,000 employees. The McKeesport Tin Plate Company has recently developed into the biggest plant of the kind in the world. There are numerous smaller manufacturing concerns, including various lines of the steel industry and more diversified interests. The large industrial plants in the city proper employ about 11,000 persons with an annual payroll of approximately $8,000,000. Smaller industries employ about 1,000 persons with an annual payroll of $600,000. Within five miles of the city limits large manufacturing plants employ another 25,000 persons, receiving over $18,000,000 in wages a year. The city has a large trade in its own manufactures and in coal and lumber. The principal educational institutions are the 14 public and the parish schools, the Douglass Business College, the Duff's Business College and the Carnegie library. Some of its principal buildings are those of the schools mentioned (the new high school cost about $260,000), the Young Men's Christian Association, 50 churches and offices and store buildings. There are 18 different religious denominations and 50 congregations in the city. The church property is valued at over a milliion and a half dollars. There are three national banks, two State banks, one trust company and one foreign banking house; total capital aggregating $1,407,100; surplus, $1,608,290, and deposits, $9,000,000. The city officials include the mayor, serving for four years, and four city commissioners, elected for two years. The city has the commission form of government under the Clark Act of Pennsylvania. The city owns and operates the waterworks, the plant being valued at over $1,000,000. The annual municipal expenditures are about $480,000; the chief items of expense are, for police department, $32,000; fire department, $35,000; street department, $37,000; water department, $95,000; health department, $10,000. Pop. over 47,000. A large number of the people are foreign born, chiefly from Austria, Sweden, Germany and Italy, but the native born predominate.

McKEEVER, William Arch, American educator: b. Jackson County, Kan., 12 April 1868. He was graduated at the University of Kansas in 1898, and later studied at the University of Chicago and at Harvard. He was professor of philosophy at the Kansas State Agricultural College in 1900–13, and since 1913 has been professor of child welfare at the University of Kansas. He originated the 'Home Training Bulletins' which have circulated widely among all English-speaking peoples; organized the playground movement and is a director of the National Institute of Child Life, Philadelphia. Author of 'Psychology and the Higher Life' (1898); 'The Pioneer, a Story of the Making of Kansas' (1911); 'Training the Boy' (1913); 'Training the Girl' (1914); 'The Successful Sunday School Teacher' (1915).

MacKELLAR, Thomas, American poet: b. New York, 12 Aug. 1812; d. 29 Dec. 1899. Having learned the printer's trade in the publishing house of the Harpers, he went to Philadelphia as a proofreader in the stereotype foundry of Lawrence Johnson and Co., in time became a partner in the business and finally its head, the new firm being styled MacKellar, Smiths and Jordan. Among his works may be mentioned 'Droppings from the Heart' (1844); 'Tam's Fortnight Ramble' (1847); 'The American Printer' (1866); 'Rhymes Atween-Times' (1873), and 'Hymns and Metrical Psalms' (1883).

McKELWAY, Saint Clair, American journalist: b. Columbia, Mo., 15 March 1845; d. 16 July 1915. In 1853 he came East and was educated in New Jersey, studied law and was admitted to the bar in New York in 1866, but never practised. In 1868 he became Washington correspondent for the New York *World* and the Brooklyn *Daily Eagle* and in 1870 a member of the editorial staff of the latter paper. From 1877 to 1884 he was the editor of the Albany *Argus*, and in the latter year returned to Brooklyn to become editor-in-chief of the *Eagle*,

which under his editorship maintained a high standard of excellence. He was a regent of the University of the State of New York since 1883, becoming vice-chancellor in 1900 and chancellor in 1913, a member of the historical societies of Long Island and Suffolk County, was director of the American Social Science Association and has lectured frequently on educational and political subjects.

McKENDREE, mą-kĕn'drĭ, **William**, American Methodist bishop: b. King William County, Va., 6 July 1757; d. near Nashville, Tenn., 5 March 1835. He served in the Continental army during the American Revolution, entered the Methodist ministry in 1787 and became a presiding elder nine years later. In 1801 he made a missionary tour beyond the Alleghanies and was an important factor in the evangelizing of that region. In 1808 he was elected bishop, being the first American-born person to hold that office in the Methodist Church. McKendree College (q.v.) was named in his honor. Consult 'Life' by Paine (1869).

McKENDREE COLLEGE, in Lebanon, Ill., founded in 1828 under the auspices of the Methodist Episcopal Church and first called Lebanon Seminary. In 1830 the name was changed, in honor of William McKendree, who gave his estate to the college. In 1839 a new charter was obtained whereby the school was granted university privileges. Abraham Lincoln rendered valuable services in securing the new charter. Students are admitted on certificates from approved schools or on examinations. It has classical, scientific, music, law and graduate departments. The degrees to which the courses lead are A.B. and B.S. In 1918 there were 15 instructors, 175 students and 10,000 volumes in the library.

McKENNA, mă-kĕn'ą, **James Andrew Joseph**, Canadian public service commissioner: b. Charlottetown, Prince Edward Island, 1 Jan. 1862. He was educated at Saint Dunstan's College, Charlottetown, was connected for a time with the Prince Edward Island Railway and afterward engaged in journalism. In 1886 he entered the Indian Department of the Dominion Civil Service, and for a brief period was private secretary to Sir John A. Macdonald. With T. G. Rothwell he effected a settlement with British Columbia concerning the administration of the railway belt lands in 1897, and in 1899 he was a royal commissioner for the negotiation of a treaty with the Indians whereby the Peace River and Athabaska Country were surrendered to the Crown. He likewise secured the surrender by the Indians of the country around Buffalo Lake, Churchill River and Reindeer Lake in 1906. He was chairman of the royal commission which was appointed to adjust the claims of the half-breeds of the Northwest, and in 1901 was the sole commissioner. Since 1909 he has been inspector of Indian Catholic schools in Manitoba, Keewatin and the Northwest provinces and territories. Author of 'Sir John Thompson' (1895), and 'The Hudson Bay Route' (1907).

McKENNA, Joseph, American jurist: b. Philadelphia, 10 Aug. 1843. In 1855 he went to California and was graduated from the Benicia Collegiate Institute in 1865, and admitted to the bar the same year. He was district attorney of Solano County in 1866–68, and in the sessions of 1875 and 1876 served as a Republican in the lower house of the California legislature. In 1885–93 he was a California representative in the 49th, 50th, 51st and 52d Congresses, resigning from the House in 1893 to accept the appointment to the office of United States circuit judge in the Ninth Federal judicial district. This post he resigned to become Attorney-General in the cabinet of President McKinley in 1897. On 16 Dec. 1897 he was made an associate justice of the United States Supreme Court to succeed Justice Field, retired, and on 26 Jan. 1898 took his seat.

McKENNA, Reginald, English statesman: b. London, 6 July 1863. He was educated at King's College, London, and at Trinity Hall, Cambridge, and became a barrister in 1887. He engaged in law practice until his election to Parliament for North Monmouthshire by the Liberal party in 1895. He soon acquired a reputation as one of the hardest workers on the Liberal benches as well as for a sound knowledge of national finance and of parliamentary procedure. In the cabinet of Sir Henry Campbell-Bannerman, formed in 1905, McKenna was appointed Financial Secretary under Chancellor of the Exchequer Asquith. In 1907 he received cabinet place as president of the Board of Education. He instituted medical inspection of the children in the schools, and reorganized the secondary school system. When the Asquith cabinet was organized in 1908 he was appointed First Lord of the Admiralty, and in 1911 he was transferred to the office of Home Secretary, where the problems incident to the crusades of the militant suffragettes caused him considerable difficulty. The so-called "Cat-and-Mouse Act" brought severe criticism from the supporters of the suffrage movement and from the Opposition. He was also prominently connected with the Welsh Church Bill, the Mental Deficiency Act and the affairs of the Administration of Criminal Justice. Upon the formation of the coalition cabinet under Asquith, in May 1915, McKenna became Chancellor of the Exchequer, succeeding Lloyd George, who was appointed to the new post of Minister of Munitions. McKenna introduced the first heavy war-tax measure and elicited high praise upon its brevity and lucidity as well as its careful distribution of the burdens of taxation. With the progress of the war, however, McKenna was thought to lean too much toward economy and not sufficiently to favor the stringent measures public opinion deemed necessary to bring the war to a speedy and definitely victorious conclusion. When the new coalition cabinet was organized under the premiership of Lloyd George, December 1916, McKenna was succeeded by Bonar Law. In the elections of 1918 he lost his re-election from North Monmouthshire, interrupting a continuous Parliamentary career of 23 years.

MacKENTY, John Edmund, American laryngologist: b. Richmond, province of Quebec, Canada, 1869. He was educated at Ottawa and McGill universities, subsequently studying in Europe. He specialized in otology, laryngology and rhinology; became professor of otology at the New York Polyclinic Medical School, and professor of laryngology and rhinology at

the Manhattan Eye, Ear and Throat Hospital and Medical School. He is a contributor to medical journals.

MACKENZIE, mą-kĕn'zĭ, Sir **Alexander,** Scottish explorer: b. Inverness, Scotland, 1755; d. near Dunkeld, 12 March 1820. He went to Canada when young, where he entered the employ of the Northwest Fur Company. In 1789 he explored the great river named after him from the western end of Great Slave Lake to the Arctic Ocean, made another expedition to the western coast (1792) and was the first white man to cross the Rocky Mountains and reach the Pacific Coast. He returned to Britain in 1801, and for his explorations received the honor of knighthood in 1802. He published 'Voyages from Montreal through the Continent of North America to the Frozen and Pacific Oceans in 1789 and 1793' (1801).

MACKENZIE, Alexander, Canadian statesman: b. Logierait, Perthshire, Scotland, 28 Jan. 1822; d. Toronto, Ontario, 17 April 1892. He emigrated to Canada in 1842. For five years he worked at the trade of a stonemason at Kingston, but then removed to Sarnia, where he became a contractor. But his chief interests were political, not commercial. In 1852 he began the publication of the Lambton *Shield,* and soon became conspicuous as one of the Liberal leaders. He entered the Canadian Parliament in 1861, and after the Confederation of Canada, in 1867, sat both in the Ontario legislature at Toronto and in the Dominion Parliament at Ottawa. When Edward Blake (q.v.) became Prime Minister of Ontario in 1871 Mackenzie joined his cabinet and became Provincial Treasurer, but in consequence of the passing of a law forbidding membership of more than one legislature, he elected in 1872 to sit in the Dominion Parliament. In 1873, when the government of Sir John Macdonald was overthrown, Mackenzie, now the leader of the Liberal party, became Prime Minister of Canada and held office for five years. His administration of public affairs was marked by rigid integrity. He himself took the great spending Department of Public Works, and contractors found in him a vigilant watchdog of the treasury. His too great devotion to the details of his office broke down his health. In 1878 his government was defeated by the advocates of protection, and in 1880 he was obliged by ill-health to hand over the leadership of the Liberal party to Mr. Blake. Though he remained in Parliament for some years he was never again able to take a prominent part in public affairs.

MACKENZIE, Sir **Alexander Campbell,** Scottish composer: b. Edinburgh, 22 Aug. 1847. He received his musical education at Sondershausen, Germany, and at the Royal Academy of Music, London, where he won the King's Scholarship in 1862. He established himself as a teacher in Edinburgh in 1865 and soon became known as a violinist of merit. He became precentor of Saint George's Church in 1870 and was appointed conductor of the Scottish Vocal Music Association in 1873. He was a member of the orchestra at the Birmingham Festivals in 1864–73. He had composed several notable pieces for the piano at this time, and at the solicitation of friends he abandoned his work as a teacher and settled in Florence where he spent the greater share of his time from 1875 to 1885 engaged in composition. From 1888 he was principal of the Royal Academy of Music. He conducted the Philharmonic concerts in 1892–99, and was knighted in 1894. Author of 'Overture, Cervantes'; the cantatas 'The Bride' (1881) and 'Jason' (1882); the operas 'Colombo' (1883); 'The Troubadour' (1886); the oratorios 'The Rose of Sharon' (1884); 'Bethlehem' (1894); incidental music for several plays among them 'The Little Minister,' 'Coriolanus' and 'Ravenswood,' and many concertos, songs, violin pieces and works for violin and orchestra.

MACKENZIE, Alexander Slidell (originally Slidell), American naval officer: b. New York, 6 April 1803; d. Tarrytown, N. Y., 13 Sept. 1848. He was a brother of John Slidell (q.v.) and assumed the name "Mackenzie" for an uncle in 1837. He entered the navy in 1815 and became a commander in 1841. While in command of the *Somers* the next year a mutiny among the naval apprentices on board was supposed to have been detected, and three of them, including a son of the Secretary of War, were hung from the yardarm on 1 Dec. 1842. He was a popular writer and among his works are 'A Year in Spain by a Young American' (1829–31; enlarged ed., 1836), which attained great popularity in England and the United States; 'Popular Essays on Naval Subjects' (1833); 'The American in England' (1835); 'Life of John Paul Jones' (1841), etc. Consult 'The Case of the Somers: Defense of A. S. Mackenzie' (New York 1843); Cooper, 'The Cruise of the Somers' (ib. 1844).

MACKENZIE, Arthur Stanley, Canadian educator: b. Pictou, Nova Scotia, 26 Sept. 1865. He was graduated at Dalhousie University in 1885, and in 1885–87 was assistant master at the Yarmouth Academy, Nova Scotia. He was scholar in physics at Johns Hopkins University in 1889–90 and Fellow there in 1890–91. He was connected with the staff of physics at Bryn Mawr College in 1891–1905, was professor of physics at Dalhousie University in 1905–10 and at Stevens Institute of Technology in 1910–11, since when he has been president of Dalhousie University. Author of 'The Laws of Gravitation' (1900).

MACKENZIE, Charles Frederick, Anglican bishop: b. Portmore, Peebleshire, Scotland, 10 April 1825; d. Malo, in the Manganja country, Africa, 31 Jan. 1862. He was graduated at Cambridge in 1848, was elected a Fellow there and was ordained a deacon in 1851. He was appointed to a curacy at Haslingfield, Cambridgeshire, in 1851, which office he filled without discontinuing his work as Fellow and tutor at Cambridge. In December 1854 he accompanied Bishop Colenzo to Natal as his archdeacon, and returned to England after a severe illness in 1859. He became the head of the Universities' Mission to Central Africa in 1860 and in 1861 was consecrated bishop of Central Africa. He was assisted by Livingstone in penetrating certain remote districts in his diocese. He died of a fever while on his way to a conference with the explorer. Consult Goodwin, 'Memoir of Bishop Mackenzie' (2d ed., 1865); Livingstone, 'Narrative of an Expedition to the Zambeezi' (pp. 348–364, 400, 410–412, 1865).

MACKENZIE, Compton, English novelist and playwright: b. West Hartlepool, 17 Jan. 1883. He was educated at Saint Paul's School and Magdalen College, Oxford, where he took the second class in modern history in 1904. He was one of the founders of the Oxford *Point of View,* and was its editor from 1902 to 1904. He has since occupied himself in writing novels and plays. He holds a commission as a lieutenant in Royal Marines. His chief publications are 'The Passionate Elopement' (1911); 'Carnival' (1912); 'Sinister Street' (Vol. I, 1913; Vol. II, 1914); 'Guy and Pauline' (1915); 'Kensington Rhymes' (1912); 'Plashers Mead,' and a volume of poems. His plays are 'Carnival' (1912) and 'The Gentleman in Grey' (1906).

MACKENZIE, Sir **George,** Scottish lawyer: b. Dundee, 1636; d. Westminster, 8 May 1691. He was a grandson of Kenneth, 1st Lord Mackenzie of Kintail, and a nephew of the 1st and 2d Earls of Seaforth. He was educated at the universities of Saint Andrew's and Aberdeen and later studied civil law at the University of Bourges, France. He was called to the bar in Scotland in 1659 and speedily rose to distinction. In 1661 he conducted the defense for the Marquis of Argyll in his trial for high treason, and soon afterward was appointed a justice-depute, or judge of the Criminal Court. In 1669 he sat for Ross-shire and rendered himself conspicuous by his opposition to Lauderdale and by his support of popular measures. He was knighted in 1674 and in 1677 succeeded Sir John Nisbet as King's Advocate. From this time Mackenzie's principles seemed wholly subverted, and in his endeavor to force submission to the king he earned for himself the appellations "Bloody Mackenzie" and "the bloodthirsty advocate." He opposed the abrogation of the penal laws against Catholics in 1686 and was removed from office until 1688, when for a year he was again King's Advocate, relinquishing the office at the outbreak of the Revolution. He founded the Advocate's Library at Edinburgh in 1689, and in 1690 he retired to Oxford where he was admitted as a student and spent the remainder of his life engaged in literary pursuits. Author of 'A Vindication of the Government of Charles II' (1691); 'The Moral History of Frugality' (1691); 'Methods of Proceeding against Criminals and Fanatical Covenanters' (1691); 'Vindication of the Presbyterians of Scotland from the Malicious Aspersions Cast upon Them' (1692), and many other works of earlier date. His collected works were published (2 vols., Edinburgh 1716–22).

MACKENZIE, George Henry, American chess player: b. near Aberdeen, Scotland, 24 March 1837; d. New York, 13 or 14 April 1891. He was appointed an ensign in the 60th Rifles in 1856, served at the Cape of Good Hope and in India and was promoted lieutenant. He returned to England and in 1861 sold his commission. He came to the United States in 1863, joined the Federal army and rose to the rank of captain. He thereafter devoted himself to chess as a professional, already having won first prize in the London Tournament of 1862, defeating the Prussian champion, Anderson. Settling in New York in 1865 he became a member of its chess club and won first prize in the tournaments of 1865, 1866, 1867, 1868. He won first prize at the Second American Chess Congress in Cleveland in 1871; fourth prize at the International Congress at Paris in 1878, and in 1887 he won the championship of the world at Frankfort. He was found dead in bed.

MACKENZIE, Henry, Scottish novelist and essayist: b. Edinburgh, 25 Aug. 1745; d. there, 14 Jan. 1831. He was a lawyer at Edinburgh, and in 1771 published anonymously 'The Man of Feeling,' which the booksellers had declined as a gratuitous offering, and which gained him a conspicuous place among 18th century writers. Other novels of his are 'Man of the World' (1773), and 'Julia de Roubigné' (1777). He edited *The Mirror,* 1779–80 (the first Scottish paper founded on the plan of *The Spectator*), and *The Lounger,* 1785–87.

MACKENZIE, James Cameron, American educator: b. Aberdeen, Scotland, 15 Aug. 1852. He was graduated at Lafayette College in 1878, at Princeton Theological Seminary in 1882 and was ordained in the Presbyterian ministry in 1885. He founded the Harry Hillman Academy, Wilkesbarre, Pa., in 1882, and also organized the Lawrenceville (N. J.) School in that year, acting as its head master in 1882–99. In 1899 he reorganized the Jacob Tome Institute, Fort Deposit, Md., and was its director until 1901. Since 1901 he has been director of the Mackenzie School, Monroe, N. Y.

MACKENZIE, John Joseph, Canadian pathologist and bacteriologist: b. Saint Thomas, province of Quebec, 1865. He was educated at the universities of Toronto, Leipzig and Berlin. He was a Fellow in biology at Toronto and later was bacteriologist to the Ontario Provincial Board of Health. Since 1900 he has been professor of pathology and bacteriology at the University of Toronto. He has contributed to various scientific magazines. He is a Fellow of the Royal Society of Canada, and member of the American Public Health Association, the Society of American Bacteriologists and of the American Association of Pathologists and Bacteriologists. He is secretary of the Canadian Institute. During the European War he was attached to No. 4 Canadian General Hospital. Author of 'Recent Theories in Regard to the Causes of Immunity to Infectious Disease' (1907).

MACKENZIE, John Stuart, British educator: b. near Glasgow, 21 Feb. 1860. He was educated at Glasgow and Cambridge universities and later studied at the University of Berlin. He was a Fellow at the University of Glasgow in 1882–84, at the University of Edinburgh in 1884–89 and at Trinity College, Cambridge, 1890–96. He was professor of logic and philosophy at the University College of South Wales and Monmouthshire in 1895–1915, then becoming professor emeritus. He was a vice-president of the Institut International de Socialogie in 1911 and president of the Moral Education League in 1908–16. Besides magazine articles and contributions to the 'Encyclopedia of Religion and Ethics' he is author of 'An Introduction to Social Philosophy' (1890; 2d ed., 1895); 'A Manual of Ethics' (1893; 8th ed., 1915); 'Outlines of Metaphysics' (1902; 2d ed., 1906); 'Lectures on Humanism' (1907); 'Elements of Constructive Philosophy' (1917).

MACKENZIE, Sir Morell, English laryngologist: b. Leytonstone, Essex, 7 July 1837; d. London, 3 Feb. 1892. He was educated at the London Hospital, Paris and Vienna. In 1859 he met Czermak in Budapest and learning from him the use of the laryngoscope he introduced its use into London. Later he became physician to the London Hospital and lecturer on diseases of the throat. In 1863 he founded the Throat Hospital in London. In 1887–88 he was associated with specialists of Berlin and Vienna in the treatment of the larynx disease of the Crown Prince, subsequently Emperor Frederick of Germany, and for these services was knighted by Queen Victoria and received the Grand Cross and Star of the Hohenzollern Order of Germany. He was the author of 'The Use of the Laryngoscope' (1866); 'Diseases of the Throat and Nose' (1880), etc.

MACKENZIE, Ranald Slidell, American soldier: b. Westchester County, N. Y., 27 July 1840; d. Staten Island, N. Y., 19 Jan. 1889. He was son of Alexander S. Mackenzie (q.v.). Graduated from West Point in 1862, he was assigned to the engineer corps, was wounded at Manassas and brevetted 1st lieutenant for services in that action. He was engineer of Sumner's division at Fredericksburg (13 Dec. 1862), and received the successive brevets of captain and major for his conduct at Chancellorsville and Gettysburg. Promoted captain of engineers 6 Nov. 1863, he took part in the Richmond campaign as commander of the 2d Connecticut Artillery. On 18 June 1864 was brevetted lieutenant-colonel for services in the Petersburg siege and commanded the 2d Connecticut Heavy Artillery in the Shenandoah campaign. He was present at Lee's surrender at Appomattox (9 April 1865), and was mustered out of the volunteer service 15 Jan. 1866. In 1882 he was made brigadier-general and in 1884 placed on the retired list.

McKENZIE, Robert Tait, American sculptor, educator and physician: b. Almonte, province of Ontario, Canada, 1867. He was graduated at McGill University in 1889 and took his M.D. there in 1892. He engaged in the practice of medicine; was connected with the medical faculty of McGill in 1895–1904, and in 1904 was appointed professor and director of the department of physical education at the University of Pennsylvania. He was appointed temporary major in the R. A. M. C. in 1915, and in 1916 was inspector of physical training of Kitchener's armies, and medical officer in charge of Heaton Park Command Depot. He is a Fellow of the College of Physicians at Philadelphia, and in 1912–15 he was president of the American Physical Education Association. His fame as a sculptor has been achieved without artistic training, his guide being his thorough knowledge of anatomy and his unusual ability in interpretation. He has exhibited at the Society of American Artists, New York; the Royal Academy, London, and the Paris Salon. Among his works as a sculptor are 'The Sprinter' (Fitzwilliam Museum, Cambridge); 'The Athlete' (Ashmolean Museum, Oxford); the statuettes, 'The Competitor' and the 'Juggler' (Metropolitan Museum, New York); 'The Youth Benjamin Franklin' (University of Pennsylvania). Author of 'The Barnjum Barbell Drill,' and 'Exercise in Education and Medicine.'

MACKENZIE, William, Canadian financier: b. Kirksfield, Ontario, 30 Oct. 1849. He was educated at the local schools and became a public school teacher. Giving up this occupation he contracted for the construction of a portion of the Victoria Railway — now the Midland division of the Grand Trunk Railway — and later executed contracts for the Coboconk, the Credit Valley, the Canadian Pacific, the Fort McLeod and Edmonton, the Regina, the Hudson Bay and Dauphin railways and other roads. He controls and is president of the Toronto Street Railway, is also interested in the Montreal and Winnipeg street railways, and with others controls the Birmingham Street Railway and other European lines. His great achievement was the construction of the Canadian Northern Railway (q.v.), of which he is president. He was knighted in 1911.

MACKENZIE, William Douglas, American Congregational clergyman: b. Fauresmith, Orange River Colony, South Africa, 16 July 1859. He graduated from Edinburgh University in 1881, studied divinity in Edinburgh and Göttingen, was professor of theology in the Chicago Theological Seminary, 1895–1903, and since 1903 has been president of Hartford Theological Seminary. He published 'The Revelation of the Christ' (1896); 'Christianity and the Progress of Man' (1897); 'South Africa: its History, Heroes and Wars' (1900); 'John Mackenzie, South African Missionary and Statesman' (1902); 'The Final Faith' (1910); 'Galatians and Romans' (in 'Westminster New Testament,' 1912).

MACKENZIE, William Lyon, Canadian journalist and political reformer: b. Dundee, Scotland, 12 March 1795; d. Toronto, Ontario, 28 Aug. 1861. In 1820 he came to Canada and conducted a drug and book store at Little York (now Toronto), and later at Queenstown, where in 1824–26 he published the *Colonial Advocate.* He transferred the *Advocate* office to Toronto in 1826, and there continued the paper until 1833, attacking the office-holding class and demanding governmental reforms. In 1828 he entered the provincial Parliament; and having been expelled for alleged libel against that assembly, was five times re-elected and as often re-expelled, until the government refused to issue another writ of election. In 1832 he went to England, and having presented to the home government a petition of grievances from the Canadian reformers, was successful in obtaining the dismissal of the attorney-general and the solicitor-general of Upper Canada and the veto of the Upper Canadian bank bill. In 1834 he was elected first mayor of Toronto, in 1836 began the publication of *The Constitution,* and, in 1837 published in that journal a bold manifesto which was practically a declaration of independence of the provincial government. Soon afterward he was the moving spirit in armed rebellion. An encounter took place between his followers and the government forces at Montgomery's Tavern, in the vicinity of Toronto (7 Dec. 1837), and the insurgents fled to Navy Island in the Niagara, where they were joined by about 500 Americans. The island was bombarded by Canadian troops, and as a result of this and the strong opposition of General Scott of the United States army, the insurgents broke camp and Mackenzie was im-

prisoned for a year in Rochester jail. Later he was a journalist in the United States, in 1849 took advantage of amnesty to return to Canada, was there a member of Parliament from 1850–58, and at Toronto published the weekly *Mackenzie's Messenger* from 1858 until shortly before his death. The reforms for which he so persistently contended were in the main achieved in his lifetime. He wrote 'Sketches of Canada and the United States' (1833). Consult the 'Life' by Lindsey (1862); Lindsey's "Life" in 'The Makers of Canada' (1910); Dent, 'Story of the Upper Canada Rebellion' (1885); Read, 'The Canadian Rebellion of 1837)' (1896).

MACKENZIE, Canada, a district in the Northwest Territories, bounded north by the Arctic Ocean, east by Keewatin, south by Athabasca, and separated on the west from Yukon by the northernmost spur of the Rocky Mountains. The district created in 1895 and administered by the government of the Northwest Territories, is the largest in Canada, having an estimated area of 563,200 square miles, of which 82,000 square miles are water. The surface generally is diversified; in the northwest it is a sterile waste; along the river valleys and on the western mountain slopes it is well forested with fir, pine, spruce and other northern trees, while coal and other minerals, although unexploited, are found. The principal lakes are Great Slave, Great Bear, Pelly and Clinton Colden. The chief rivers are the Mackenzie, the Coppermine and the Great Fish or Back River. The soil is comparatively unproductive, the climate being arctic and inhospitable except for the few summer months. The population, about 5,400, inhabit the trading settlements of the Hudson's Bay Company's along the Mackenzie and its tributaries. The pelts of the fur-bearing animals of the region are practically the only developed item of commerce.

MACKENZIE RIVER, Canada, a large river in the Northwest Territories, which flows from the Great Slave Lake, and after a northwesterly course of about 1,000 miles enters the Arctic Ocean by numerous mouths at the island-studded Mackenzie Bay. Its ultimate source is in Thutage Lake, the headwaters of the Finlay in northern British Columbia; its total length from Thutage Lake to the sea is 2,525 miles. Its tributary head-streams are the Great Peace River, which rises in British Columbia beyond the Rocky Mountains, and the Athabasca or Elk River, which has its source in the Rockies; these two rivers flowing into Lake Athabasca are discharged by the Great Slave River into Great Slave Lake whence issues the Mackenzie. The principal affluent of the Mackenzie is the Laird or Mountain River. With the exception of a slight obstruction in the rapids near Fort Good Hope, in lat. 66° N., the Mackenzie and its tributaries are navigable for a distance of over 1,800 miles, and from June to October steamboats of the Hudson's Bay Company ply from Great Slave Lake almost to the Arctic Ocean. Forts Providence, Norman and Good Hope are trading stations along its banks, while Forts McPherson, Franklin, Enterprise, Reliance, Resolution, Chippewyan, Nelson and Graham are along its tributaries. The valley is well-wooded with spruce, pine, poplar and birch, while coal, salt and other minerals abound in the region. The river is named after Alexander Mackenzie (q.v.), who first explored it in 1789.

MACKEREL, măk'ĕ-rĕl. The common mackerel (*Scomber scombrus*) is the best-known and most important member of the family *Scombridæ* and one of the most valuable of food-fishes, ranking in this respect behind the cod and herrings only. The mackerel is a compactly built fish of smooth and regular outline, the fusiform figure tapering accurately to the pointed snout, so that it cleaves the water easily. The large, deeply-forked tail is supported on a slender peduncle, provided with two small keels on each side, and preceded by a dorsal and a ventral series of finlets of five each. A soft dorsal and a counterpart anal fin are placed exactly opposite each other and behind the level of the vent, and the anterior dorsal fin is supported by usually 11 delicate spines. Very numerous and small scales cover the body nearly uniformly, but are absent from the head. The large mouth is provided with numerous small sharp teeth. The gill-rakers are long and the air-bladder is wanting. The color of the back is deep blue, marked by about 35 nearly vertical wavy black lines; below, the fish is silvery white. A recent close study of the species on the European side of the Atlantic establishes the existence there of local races, as in the herring, but it appears that the American representatives, while constituting a race distinct from the European, are more homogeneous.

The mackerel is an abundant fish on both sides of the north Atlantic, on the American side ranging from Cape Hatteras to the Straits of Belle Isle, and on the European from northern Norway to the Canary Islands and throughout the Mediterranean. While a true pelagic fish of wandering and migratory habits and, like most such, capricious in its movements, the great body of mackerel approaches the American coast and moves along it northward as the temperature of the water rises to about 45° F. On the approach of winter they retire to a greater distance from the land, but a few remain throughout the year near the coast. Mackerel swim in great schools at or near the surface; one such covering an area of 10 square miles, and another estimated as containing 1,000,000 barrels, have been observed. The local movements of the schools are largely regulated by the food-supply, which consists of small pelagic fishes, various kinds of small crustaceans, etc., which are pursued with great eagerness. On the other hand, the bluefish and other carnivorous fishes, porpoises, squids and fish-eating birds, are relentless enemies. Spawning takes place in the open sea, not far from the coast from Vineyard Sound to the Gulf of Saint Lawrence, and during the months of May, June and early July. The eggs are about one millimeter in diameter, contain an oil-drop and float at the surface, where the young fish develop and live. They grow rapidly and are about five inches long by the end of the first half year, when they are known as "spikes"; "blinkers" are about one year old and six or seven inches long; "tinkers" are seven to nine inches long and are supposed to be two years old. At the age of three or four

years the mackerel is mature and from 12 to 18 inches long. The very largest specimens weigh about four pounds and have a length of 22 to 23 inches.

The mackerel fishery is of the greatest importance in the New England States and Nova Scotia, and in Norway, Ireland and Great Britain. In Europe the fishery is prosecuted almost exclusively by means of small boats and hand lines, but in America is chiefly carried on in staunch sea-going schooners, most of which hail from Gloucester, Mass., and which are equipped with purse seines, by means of which entire schools are surrounded and captured. The fishing begins off Cape Hatteras in March or April and the schools are followed northward as they appear successively on the New Jersey, New England and Canadian coasts. In addition to the operations of this mackerel fleet, local fisheries are carried on along much of the coast, with pound-nets, gill-nets and hand-lines. The spring and local catches are generally sold fresh, the summer catch being split and salted. The product of the fishery has been peculiarly subject to fluctuations, due in large part to alternating periods of abundance and scarcity of the fish. Colonial writers refer to its great plenty, and statistics of the catch inspected in Massachusetts show a somewhat regular recurrence of such periods at intervals of about 20 years. From 350,000 barrels in 1880 and 395,000 in 1881, the catch steadily declined to 75,000 in 1886, and 18,000 in 1891, since which time it has greatly fluctuated.

For 1914–15 the number of fry distributed was 4,847,000, and in the succeeding year 1,946,000. In 1915 the returns for salted mackerel were 19,691 barrels, exceeding the previous year by 4,170 barrels, while the total catch of fresh mackerel was 71,564 barrels against 68,582 in the previous year. The returns for New England up to 30 June 1916 show an increase of 63 per cent in quantity and 73 per cent or $259,354 in value. In the spring of 1916 mackerel reached the unheard-of price of 40 cents apiece for the larger fish. The Canadian provinces in 1914–15 give 143,712 hundredweights, as against 215,442 hundredweights in the previous year,— a decline in values of $453,473; the quantity in 1915–16 was 180,990 hundredweights, representing an increased value $180,990 over 1914–15. An elaborate account of the American mackerel fishery will be found in Brown-Goode's 'Materials for a History of the Mackerel Fishery' (Report of the United States Fish Commission, 1884); for some recent views see Moore, 'Report National Fishery Congress' (Washington 1898); and for methods of preservation, Stevenson, 'The Preservation of Fishery Products for Food' (Bulletin of United States Fish Commission, 1898).

MACKEREL SHARK, or **PORBEAGLE,** a shark of the family *Lamnidæ*, allied to the man-eater (q.v.), and like it sometimes called blue shark, on account of its color, which is frequently seen on both sides of the northern Atlantic Ocean; it is the *Lamna cornubica* of ichthyologists. The ordinary length is about 10 feet, and they become very abundant in summer, when the mackerel are running, along the New England coast, and also about Great Britain, where they are called porbeagles. They are a nuisance to fishermen by destroying their nets, through which several will often tear their way (for they roam about in bands) in pursuit of captured fish. Formerly considerable quantities of oil were saved from their livers, but at present the value of this commodity does not pay for the trouble of taking them.

MACKEY, Albert Gallatin, American writer on Freemasonry: b. Charleston, S. C., 12 March 1807; d. Fortress Monroe, Va., 20 June 1881. He was graduated from the Medical College of South Carolina in 1832 and was demonstrator of anatomy there in 1838, but after 1844 devoted himself to studies of Freemasonry and became a standard authority on the subject. Among his works are 'A Lexicon of Freemasonry' (1845); 'The Mystic Tie' (1849); 'Book of the Chapter' (1858); 'A Manual of the Lodge' (1862); 'A Textbook of Masonic Jurisprudence' (1869); 'Encyclopædia of Freemasonry' (1874).

McKIBBEN, Chambers, American soldier: b. Pittsburgh, Pa., 2 Nov. 1841. He enlisted as a private in the volunteer service 22 Sept. 1862, was brevetted captain for gallant services in the battle of North Anna River (Va.) and in the operations on the Weldon Railway, and on 1 May 1896 attained the rank of lieutenant-colonel of the 21st United States Infantry. At the beginning of the war with Spain he went to Cuba with Shafter's army, fought at Santiago (1 July 1898), and was made brigadier-general of volunteers and appointed military governor of Santiago. On 12 May 1899 he was mustered out of the volunteer service. Retiring in the same year, he was put in command of the Department of Texas, and two years later was transferred to the command of an infantry regiment. In 1902 he retired with the rank of brigadier-general.

MACKIE, Pauline Bradford. See HOPKINS, PAULINE BRADFORD MACKIE.

McKIM, Charles Follen, American architect: b. Chester County, Pa., 24 Aug. 1847; d. 14 Sept. 1909. He studied at the Lawrence Scientific School in 1866, at the Beaux-Arts of Paris in 1867–70, and shortly afterward entered into partnership with Sanford White and William R. Meade. This firm achieved some of the finest triumphs of recent American architecture. Among notable examples of its work are the buildings of Columbia University, and the Public Library of Boston. In 1903 McKim received the royal gold medal from the Royal Institute of British Architects in recognition of his services to architecture. He was the second American to obtain this honor, R. M. Hunt (q.v.) having been the first. On the occasion of the presentation he made an able speech reviewing the progress of his profession in the United States. He was elected president of the American Institute of Architects.

McKIM, James Miller, American abolitionist: b. near Carlisle, Pa., 14 Nov. 1810; d. Llewellyn Park, West Orange, N. J., 13 June 1874. He was graduated from Dickinson College (Carlisle, Pa.) in 1828, studied medicine at the University of Pennsylvania and theology at Princeton (1831) and Andover (1832), and in 1835 was ordained a Presbyterian pastor in Womelsdorf, Pa. An original member of the American Anti-Slavery Society, he became its

lecturing agent in October 1836, and spoke throughout Pennsylvania, often at great personal danger. In 1840 he removed to Philadelphia, where he was publishing agent of the Pennsylvania Anti-Slavery Society and later corresponding secretary until 1862. In November 1862 he called a public meeting in Philadelphia to provide for 10,000 slaves suddenly liberated by the capture of Port Royal, S. C. As a result, the Philadelphia Port Royal Relief Committee was formed. This committee was expanded in November 1863 into the Pennsylvania Freedman's Relief Association, of which McKim became the corresponding secretary. In that capacity he was active in the establishment of negro schools in the South. In 1865–69 he was corresponding secretary of the American Freedman's Commission, which on his motion was disbanded in July 1869. In 1865 he assisted in founding and became a proprietor of the New York Weekly *Nation*. During the Civil War he was an advocate of the enlistment of negro troops, and as a member of the Union League of Philadelphia assisted in the recruiting of 11 colored regiments.

MACKINAC (măk'ĭ-năk or măk'ĭ-nâ) **ISLAND,** Mich., in Mackinac County, at the entrance to Straits of Mackinac, in the northwest part of Lake Huron, about 255 miles north by west of Detroit. The island is about three miles long and two wide. It is rocky, and covered with trees, shrubs and flowers. The island has been prominent since the early missionaries and explorers mentioned it in connection with its command of the channel entering the straits. An interesting historic point on the island is Fort Mackinac, one of the oldest fortifications in the United States. The city of Mackinac on the southeast shore was chartered in 1900. Pop. of the city 720.

MACKINDER, mą-kĭn'dẽr, **Halford John,** English author and educator: b. Gainsborough, 15 Feb. 1861. He was educated at Christ Church, Oxford; in 1883 was president of the Oxford Union; Burdett-Coutts University scholar 1884; barrister, Inner Temple 1886; reader in geography, Oxford University 1887–1905; and from 1903–08 director of the London School of Economics and Political Science. He was leader of the Mount Kenya Expedition 1899; and has been member (Unionist) for the Camlachie division of Glasgow since 1910. He has written 'Britain and the British Seas' (1902); 'The Rhine' (1908); 'Elementary Studies in Geography' (12th ed., 1914); 'Eight Lectures on India' (1910), etc.

McKINLEY, mą-kĭn'lĭ, **William,** American statesman, 25th President of the United States: b. Niles, Trumbull County, Ohio, 29 Jan. 1843; d. Buffalo, N. Y., 14 Sept. 1901. He was educated at Union Seminary, Poland, Mahoning County, Ohio, and Alleghany College, Meadville, Pa. (1860–61). Forced by illness to discontinue his college course, he taught in the public schools, was a clerk in the Poland postoffice and on 11 June 1861 enlisted for the Civil War as a private in Company E of the 23d Ohio Volunteer Infantry. His first battle was that of Carnifex Ferry (10 Sept. 1861), and on 15 April 1862, while in camp at Fayetteville, western Virginia, he was promoted commissary sergeant. For conspicuous service at Antietam (17 Sept. 1862) he was made second lieutenant of Company D. His subsequent appointments were, first lieutenant, Company E (7 Feb. 1863); captain Company G (25 July 1864); and brevet major (14 March 1865). When mustered out on 26 July 1865 he was acting assistant adjutant-general on the staff of Gen. S. C. Carroll, commanding the veteran reserve corps stationed at Washington. Among other actions in which he participated were those of South Mountain (14 Sept. 1862), Lexington (10 June 1864), Kernstown (24 July 1864), Opequan Creek (Winchester, 19 Sept. 1864), Fisher's Hill (22 Sept. 1864) and Cedar Creek (19 Oct. 1864). During his subsequent political career he was generally known, especially in Ohio, as Major McKinley. At the close of the war he began the study of law at Youngstown, Ohio (1865–66), continued it at the Albany (N. Y.) Law School (1866–67), in March 1867 was admitted to the bar at Warren, Trumbull County, Ohio, and at once entered practice at Canton. In 1870–71 he was prosecuting attorney of Stark County, and during the campaign between R. B. Hayes and William Allen for the governorship of the State, spoke effectively against the "greenback" craze. He was elected to Congress as Republican representative from the 17th Ohio district in 1877, and served continually in the 45th, 46th and 47th Congresses (1877–83). It was asserted by the Republicans that he was elected in 1882 to the 48th Congress by a majority of eight ballots; but, although he had received the certificate of election, his seat was successfully contested by J. H. Wallace, who was not, however, seated until June 1884. He represented the 20th district in the 49th Congress (1885–87), and the 18th in the 50th and 51st Congresses; but in 1890 was defeated in the 16th for the 52d Congress by 300 ballots by J. G. Warwick, Democrat, lieutenant-governor of the State a short time previously. His defeat was attributed to the gerrymandering of the district by a Democratic legislature. His service in Congress was notable. In 1877 he was appointed a member of the Judiciary Committee, and in December 1880 of the Ways and Means Committee to succeed James A. Garfield; and in 1881 was chairman of the committee in charge of the Garfield memorial exercises in the House. In 1889–90 he was chairman of the Ways and Means Committee. He was a candidate for speaker of the 51st Congress, but was defeated by T. B. Reed on the third ballot in the Republican caucus. He was known among the foremost orators of the House; and his speeches on arbitration as a solution of labor troubles (2 April 1886) and in support of the civil service laws (24 April 1890) were most favorably received. But his principal efforts were made in connection with the tariff, which, from his first appearance in the House, was the chief object of his study. On 6 April 1882 he spoke in advocacy of protection; on 30 April 1884 in opposition to the Morrison tariff bill, making what was esteemed the ablest argument against that measure; and on 7 May 1890 in support of the general tariff bill, now known by his name, which, as chairman of the Ways and Means Committee, he had introduced before the House on 16 April. The bill was passed by the House on 21 May, by the Senate on 11 September, and on 6 October became a law. His bill obtained for him an international reputation, and

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WILLIAM McKINLEY

Twenty-fifth President of the United States

eventually the Presidency. In 1884 he was delegate-at-large from Ohio to the Republican National Convention at Chicago, where he supported Blaine's candidacy, and where, as chairman of the committee on resolutions, he helped to determine the platform of his party, which he read before the convention. In the Republican National Convention at Chicago in 1888, he was again a delegate and chairman of the committee on resolutions. He supported the candidacy of John Sherman, although, when it was finally learned that Blaine would decline the nomination, he was himself the choice of many delegates and was strongly urged to permit the use of his name. At the Minneapolis convention of 1892 he was once more a delegate and was elected permanent chairman of the assembly. He supported the renomination of President Harrison, and though refusing the use of his own name, received the ballots of 182 delegates. He then left the chair and moved to make Harrison's nomination unanimous, which was accordingly done. In the ensuing campaign he took a very active part, traveling, it was estimated, more than 16,000 miles and speaking to more than 2,000,000 voters. In 1892–96 he was governor of Ohio, having been elected in 1891 by 21,500 plurality, and in 1893 by the unusual plurality of 80,995. Labor riots occurred during his administration, necessitating the placing of 3,000 militia troops in active service, but the difficulties were successfully adjusted. McKinley also personally directed the relief work for the starving miners of the Hocking Valley district. He was nominated for the Presidency by the Republican National Convention which met at Saint Louis 16 June 1896, and was elected by a plurality of 601,854 over W. J. Bryan, receiving a popular vote of 7,104,779, and in the electoral college a vote of 271 to 176 for Bryan. Throughout the campaign he remained in Canton, where he made over 300 speeches to more than 750,000 visitors. Under his administration decided increase in business prosperity followed the passage of the Dingley tariff measure. The most important event of his term was the Spanish-American War (q.v.), which he had believed might be prevented and had done all in his power to avert. When hostilities broke out on the part of certain inhabitants of the Philippine Islands, the President appointed a commission to study the situation and report on the most suitable mode of government for the new territory. On 7 July 1898 he approved the joint resolution of Congress for the annexation of the Hawaiian Islands, and in 1898 he also selected a delegation to represent the United States in The Hague peace conference which convened in May 1899. The original Philippine commission having rendered a report (31 Jan. 1900), the President appointed a new commission, known from its head, Judge W. H. Taft, as the Taft commission, under whose direction civil government was instituted in the islands on 1 Sept. 1900. (See PHILIPPINES, *History*). In 1900 the President stood conspicuously for justice in the settlement of the difficulties in China which marked that summer. He was renominated for the Presidency by the Republican National Convention which met at Philadelphia on 25 June 1900, receiving the entire vote of the 930 delegates. He was elected by a popular vote of 7,206,677 to 6,374,397 for W. J. Bryan, receiving till then, the largest popular majority ever given a candidate for the Presidency. He obtained 292 electoral votes and carried 28 States. On 5 Sept. 1901 he delivered at the Pan-American Exposition, Buffalo, N. Y., an important address, summarizing at once the problems then before the nation and his policy for their solution. On 6 September, while holding a reception in the Music Hall of the Exposition, he was twice shot by Leon Czolgosz (q.v.), an anarchist. He died on 14 September; and 19 September was appointed by his successor, President Roosevelt, a day of mourning and prayer throughout the United States. Unprecedented honors were paid to McKinley's memory in foreign capitals, notably in London, where memorial services were held in Westminster Abbey and Saint Paul's Cathedral. A statue was erected in his honor at Columbus, Ohio, and unveiled in 1906. Consult Smith (editor), 'Speeches and Addresses of William McKinley' (1893); Porter, 'The Life of Major McKinley' (1896), and 'Specches and Addresses of William McKinley from 1897 to 1901' (1900). See also UNITED STATES, *History*.

McKINLEY, Mount, United States, a peak of the Rocky Mountains, the highest in North America, south of the central part of Alaska, about 155 miles north of Cook Inlet. The Indian name for this peak is Traleyka and the Russian name, Bolshaya. The fact that this is the highest land on the continent was not known till 1896 when Mr. Dickey explored the Sushitna River and the land near its source. He estimated the height of the peak at 20,000 feet, and named it McKinley, in honor of William McKinley (q.v.). In 1903 it was visited by members of the United States Geological Survey. The mountain is a great dome-shaped mass, over 20,000 feet above the sea. Consult Balch, E. S., 'Mount McKinley and Mountain Climbers' Proofs' (Philadelphia 1914); Browne, A., 'The Conquest of Mount McKinley' (New York 1914).

McKINLEY ACT, a name popularly given to a tariff bill reported to Congress, 21 May 1890, by the Ways and Means Committee of the House of Representatives, of which William McKinley was chairman. It became a law in October 1890 and was repealed in 1894. It increased the duties on wool, woolen manufactures, on tin-plate, barley and some other agricultural products and remitted the duty on raw sugar. The reciprocity feature was an important part of the bill, providing for the remission of duty on certain products from those countries which should remove duties on American imported products. See TARIFF.

McKINNEY, Mrs. Glen Ford. See WEBSTER, JEAN.

McKINNEY, mȧ-kĭn'ĭ, Tex., city, county-seat of Collin County, on the Missouri, Kansas and Texas and the Houston and Texas Central railroads, about 30 miles north by east of Dallas. It is situated in a rich agricultural region, served by the Texas Traction Company, in which cotton is cultivated quite extensively. The chief industrial establishments are cotton-seed-oil mills, cotton gins, cotton compresses, wagon and carriage shops and flour mills. It is the seat of the McKinney Collegiate Institute, has five schools and a courthouse, a fine

building, cost $100,000. The waterworks are owned and operated by the city. The commission form of government has been adopted. Pop. 10,000.

MACKINTOSH, măk'ĭn-tŏsh, Sir **James,** Scottish historian and philosophical writer: b. Aldourie, Inverness-shire, 24 Oct. 1765; d. London, 30 May 1832. He was educated at Aberdeen and Edinburgh; studied medicine and took the M.D. degree in 1787; published his 'Vindiciæ Gallicæ' in answer to Burke's 'Reflections on the French Revolution'; quitted the medical profession and was called to the English bar in 1795. By reason of his brilliant lectures on the 'Laws of Nature and Nations,' and his defense of Peltier, who was prosecuted for a libel on Napoleon Bonaparte, he acquired fame at the bar, and in 1804 was appointed recorder of Bombay and received the honor of knighthood. After an honorable career in India he returned to England, entered Parliament for Nairn and afterward for Knares-borough; was professor of law at Haileybury College (1818–24), a member of Privy Council and in 1830 commissioner of the Board of Control. Among his writings may be mentioned his 'History of England,' a fragment extending only to the reign of Elizabeth; 'Dissertation on the Progress of Ethical Philosophy' in the Encyclopædia Britannica; a 'Life of Sir Thomas More' in Lardner's 'Cyclopædia,' and nine chapters of an unfinished work on the Revolution of 1688.

MACKINTOSH, a water-proof overcoat, or outer garment, one of the products of modern rubber manufacture. It derives its name from the inventor, Charles Mackintosh of Manchester (1766–1843). See India Rubber.

MACKLIN, măk'lin, **Charles,** Irish actor and dramatist: b. Ireland, 1 May 1697; d. London, 11 July 1797. He was the son of an Irish gentleman named McLaughlin and in 1733 appeared in minor parts at Drury Lane, London. He steadily rose in public favor, till 1741 he appeared in his greatest rôle, Shylock. He was accounted from this period among the best actors of the time. His last performance was at Covent Garden in May 1789, at past the age of 90. In 1735 he accidentally killed a brother actor in a quarrel and was tried for murder, and was frequently afterward engaged in disputes and actions at law. Of his own plays only 'The Trueborn Irishman'; 'Love a-la-Mode' (1759), and 'The Man of the World' (1781) have been printed. Consult 'Life' by Parry (1891).

MACKUBIN, măk-kūb'ĭn, **Florence,** American artist: b. Florence, Italy, 19 May 1861. She was of American parentage, and studied under Louis Deschamps and Julius Rolshoven in Paris and Herterrich in Munich, also studying miniature painting under Mlle. J. Devina in Paris. Since completing her studies she has lived chiefly at Baltimore, Md. She has specialized in portrait and miniature painting, and her work was exhibited at the Columbian Exposition, 1893; the Tennessee Exposition in 1897; at Paris, 1900; at Buffalo, 1901; Charleston, 1902, and Saint Louis, 1904. She was officially commissioned to execute various portraits for the Executive Mansion and State House, Maryland, among them a copy of Van Dyck's portrait of Queen Henrietta Maria, and portraits of Governors Calvert and Eden of Maryland. Among other portraits are those of Sir Charles Drury at the Admiralty House, Chatham, England, and Sir William Van Horne, Canada. Her miniatures won a medal at the Tennessee Exposition. Among them is one of Cardinal Gibbons.

McLACHLAN, măk-lăk'lăn, **Alexander,** Scottish Canadian poet: b. Johnstone, Renfrewshire, Scotland, 12 Aug. 1818; d. Orangeville, Ontario, 20 March 1896. He removed to Canada in 1841; was Canadian immigration agent to Scotland in 1862, and in 1874 delivered in Scotland a series of lectures on Canadian life. He lectured also in Canada and the United States. He was a man of broad and democratic sympathies and was deeply interested in the betterment of conditions among the working classes. Author of 'Poems, Chiefly in the Scottish Dialect' (1855); 'Lyrics' (1858); 'The Emigrant and Other Poems' (1861); 'Poems and Songs' (1874).

MACLAGAN, William Dalrymple, English archbishop: b. Edinburgh, 18 June 1826; d. 19 Sept. 1910. He was educated at Edinburgh and was graduated in mathematical honors at Cambridge University. He served in the Indian army (1847–49); was ordained deacon (1856) and priest (1857). He was appointed bishop of Lichfield (1878) and archbishop of York in 1891. He published 'Pastoral Letters and Synodal Charges' (1892).

McLANE, măk-lān', **Allan,** American soldier and jurist: b. 8 Aug. 1746; d. Wilmington, Del., 22 May 1829. In 1774 he settled in Kent County, Del., and in the Revolution he took a prominent part. He became a lieutenant in Thomas Rodney's regiment of Delaware militia, where he rendered important service at Long Island and White Plains and also in the New Jersey campaign. In 1777 he was made captain and was in command of the American guard about Philadelphia, taking active part in the battle of Monmouth. With the rank of major under Gen. Henry Lee he participated in the capture of Stony Point and Paulus Hook and attained colonel's rank. At the close of the war he was appointed judge of the Delaware Court of Appeals. In 1790–98 he was United States marshal of Delaware under Washington's appointment, and from 1808 until his death collector of Wilmington (Del.) port. He also served in the Delaware legislature, being for a time speaker of the lower house.

McLANE, James Woods, American physician: b. New York, 19 Aug. 1839; d. 25 Nov. 1912. He was graduated at Yale University in 1861 and took his M.D. at the College of Physicians and Surgeons, Columbia, in 1864. He was thereafter for many years connected with the medical faculty of the College of Physicians and Surgeons, as lecturer on materia medica in 1866–67, professor of materia medica and therapeutics 1868–72, adjunct-professor of obstetrics, diseases of women and children and medical jurisprudence in 1872–79, professor of gynecology in 1882–85 and of obstetrics in 1891–98. He became professor emeritus in 1898; and in 1891–1903 he was dean of the medical faculty. From 1905 until his death he was president of Roosevelt Hospital.

McLANE, Louis, American statesman: b. Smyrna, Kent County, Del., 28 May 1786; d. Baltimore, 7 Oct. 1857. He was the son of Allan McLane (q.v.), and entering the navy at an early age, served as a midshipman under the elder Decatur. Quitting the navy in 1801 he studied law, was admitted to the bar in 1808 and rose to eminence in the profession. He represented Delaware in Congress, 1816–27, when he was chosen United States senator. In 1829–31 he was Minister to Great Britain, and on his return home was made Secretary of the Treasury. In 1833 he declined to sanction the removal of the deposits from the United States Bank, and was consequently transferred by the President to the State Department. He held the office of Secretary of State till June 1834, when he resigned and retired from political life. In 1837 he accepted the presidency of the Baltimore and Ohio Railroad, which he held till 1847. In June 1845 he was appointed by President Polk ambassador to London during the Oregon negotiations, after the settlement of which he resigned. In 1850 he was a member of the convention to reform the constitution of Maryland.

McLANE, Robert Milligan, American politician and diplomat: b. Wilmington, Del., 23 June 1815; d. Paris, France, 16 April 1898. He studied at the Collège Bourbon of Paris (1829–31), was graduated from West Point in 1837, took active part in the Seminole War in Florida (1837), and served under General Scott in the Cherokee country (Georgia). He resigned from the army in 1843, and having already been admitted to the bar in the District of Columbia, began practice at Baltimore, Md. In 1847–51 he was a Democratic member of the House of Representatives in the 30th and 31st Congresses. In 1853 he was appointed commissioner, with powers of minister plenipotentiary, to China, Japan, Siam, Korea and Cochin China: and from this mission he returned in 1856, having with Commodore Perry concluded important treaties. In 1859–61 he was Minister to Mexico, in which capacity he signed the treaty of 1860. In 1861 he returned to Baltimore and there took a prominent part in the discussions attending the secession of the Cotton States. He was one of the committee appointed by the Maryland legislature (May 1861) to confer with Lincoln in regard to alleged unconstitutional proceedings on the part of the Federal government within the State of Maryland. Upon the decision of the State legislature, based on the committee's report, that it was inexpedient for Maryland to secede, McLane retired from public affairs for a time. In 1877–78 he was State senator; in 1879–83 a representative in the 46th and 47th Congresses; and in 1883–85 governor of Maryland. He was Minister to France in 1885–89 by appointment of President Cleveland. After tendering his resignation in 1889, he spent his remaining years at Paris.

MACLAREN, mą-klär'ĕn, **Ian.** See WATSON, JOHN.

McLAREN, William Edward, American bishop: b. Geneva, Ontario County, N. Y., 15 Dec. 1831; d. New York, 19 Feb. 1905. He was graduated at Jefferson College, 1851, ordained to the Presbyterian ministry, 1860, and entered that of the Protestant Episcopal Church in 1872. Three years later he was appointed bishop of Illinois; after the subsequent division of the diocese became bishop of Chicago. He founded the Western Theological Seminary at Chicago (1883) and the Waterman Hall for Girls at Sycamore, Ill. Among his writings may be mentioned 'Catholic Dogma the Antidote of Doubt' (1884); 'Analysis of Pantheism' (1885): 'The Holy Priest' (1889); 'The Essence of Prayer' (1901).

McLAUGHLIN, măk-lâk'lin, **Andrew Cunningham,** American historical writer: b. Beardstown, Ill., 14 Feb. 1861. He was graduated from the University of Michigan in 1882, from its law school in 1885, was professor of history there 1891–1906 and since 1906 at the University of Chicago. He was director of the bureau of historical research of Carnegie Institution, Washington, D. C., 1903–05, and managing editor of the *American Historical Review*, 1901–05. He has written 'Lewis Cass' (in 'American Statesman' series 1891); 'History of Higher Education in Michigan'; 'Civil Government in Michigan' (1892); 'History of the American Nation' (1899); 'The Confederation and the Constitution' (1905); (with Van Tyne) 'History of United States for Schools' (1911); 'The Courts, The Constitution and Parties' (1912); and (with Hart) edited 'The Cyclopædia of American Government' (1914).

McLAUGHLIN, Mary Louise, American artist: b. Cincinnati. She began to decorate pottery in 1877 and made Losanti porcelain (1898), exhibiting for the first time in the Paris Exposition of 1900. She has been awarded several public honors for her work. Among her published writings are 'China Painting'; 'Pottery Decoration'; 'Suggestions to China Painters'; 'Painting in Oil'; 'The Second Madame.'

MACLAURIN, măk-lâ'rin, **Colin,** Scottish mathematician and philosopher: b. Kilmodan, Argyleshire, February 1698; d. 14 June 1746. He was educated at Glasgow University, and in 1717 became professor of mathematics in Marischal College, Aberdeen, and two years after was chosen Fellow of the Royal Society. In 1720 he published 'Geometrica Organica,' a work on curves. In 1725 he was elected professor of mathematics at Edinburgh, where his lectures contributed much to raise the character of that university as a school of science. A controversy with Bishop Berkeley led to the publication of Maclaurin's great 'Treatise on Fluxions' (1742). He also wrote a 'Treatise on Algebra'; 'Account of Sir Isaac Newton's Philosophical Discoveries,' etc.

MACLAURIN, Richard Cockburn, American educator: b. Lindean, Scotland, 5 June 1870. He took his M.A. at the University of Cambridge in 1897, was elected a Fellow at Saint John's College, Cambridge, in 1897 and was professor of mathematics there in 1898–1905. He was dean of the faculty of law at the New Zealand University in 1905–07; and in 1907–09 he was professor of mathematics at Columbia University, New York. Since 1909 he has been president of the Massachusetts Institute of Technology. Author of 'Title to Realty' (1909); 'Theory of Light' (1909); 'Lectures on Light' (1909).

MacLAWS, măk-lâz', **Lafayette,** American military officer: b. Augusta, Ga., 15 Jan. 1821; d. Savannah, Ga., 24 July 1897. He was grad-

uated at West Point in 1842; served in the Mexican War till the surrender of Vera Cruz; and at the beginning of the Civil War was commissioned a brigadier-general in the Confederate army. He was promoted major-general 23 May 1862, and during the march of Sherman to the sea commanded the defenses of Savannah and had charge of the military district of Georgia. He was appointed collector of internal revenue at Savannah in 1875 and postmaster there in 1876.

MACLAY, mą-klā', **Edgar Stanton,** American author: b. Foochow, China, 18 April 1863. He was graduated at Syracuse University in 1885; was reporter on the Brooklyn *Times,* 1886–90, and on the New York *Tribune* 1891–93; served on the editorial staff of the *Tribune,* 1893–95, and on that of the New York *Sun,* 1895–96. In 1896 he was appointed lighthouse-keeper at Old Field Point, and in 1901 received an appointment at the New York navy yard. He edited the 'Journal' of William Maclay (q.v)., and is the author of a 'History of the United States Navy,' which occasioned much controversy and brought about his dismissal from government employ, by order of President Roosevelt, in 1901. The ground of this action, following Maclay's refusal of an official request for his resignation, was a passage in the 'History' stigmatizing Rear-Admiral Schley as a "caitiff, poltroon and coward" for his conduct in the naval fight off Santiago, Cuba, 3 July 1898. Maclay has also written 'Reminiscences of the Old Navy' and 'The History of American Privateers.'

MACLAY, Robert Samuel, American Methodist Episcopal clergyman: b. Concord, Franklin County, Pa., 7 Feb. 1824; d. 1907. He was graduated at Dickinson College in 1845 and entered the Methodist ministry in 1846. He sailed as a missionary to Foochow, China, 13 Oct. 1847. He was a member of the committee which translated the New Testament into the Foochow dialect; and in 1852–72 he was superintendent and treasurer of the Foochow Mission. He was transferred to Japan in 1872, becoming secretary and treasurer of the mission there; and assisted in translating the New Testament into Japanese. He was a delegate from Japan to the Ecumenical Methodist Conference at London in 1881. He was one of the founders of the Anglo-Chinese College at Foochow in 1881; and in 1884 he secured from the king of Korea permission to establish Christian missions in that country. He was instrumental in founding at Tokio in 1883 the Anglo-Japanese College, of which he was president in 1883–87; and the Philander Smith Biblical Institute in 1884, serving as dean in 1884–87. He was dean of the Maclay College of Theology at San Fernando, Cal., from 1888 until his retirement in 1893. Author of 'Life Among the Chinese' (1861); coauthor with Rev. C. C. Baldwin 'Dictionary of the Chinese Language in the Dialect of Foochow' (1871).

MACLAY, William, American soldier and politician: b. New Garden, Chester County, Pa., 1737; d. 1804. He was educated in his native place; was a lieutenant in the French and Indian War, taking part in the expedition against Fort Duquesne in 1758 and afterward serving under General Bouquet. He studied law, was admitted to the bar, went to England on behalf of militia officers serving in the French and Indian War, to confer upon their claims for land-grants with the proprietors of Pennsylvania, and on his return became attorney to the Penn family. In the Revolution he raised troops and equipped them, was assistant commissary of purchase and performed some field service. In 1781 he was elected to the Pennsylvania assembly, afterward held other offices in the State, and with Robert Morris (q.v.) was elected to the United States Senate, Pennsylvania's first representatives in that body. His service there ended in 1791, but in the Senate he had shown deep-seated hostility to Washington and his administration, which was the chief distinction of Maclay's senatorial career. In his later years he was a member of the Pennsylvania legislature and his last public office was that of a county judge. Consult his 'Journal,' edited by Edgar Stanton Maclay (q.v.).

MACLE, măk'l, in mineralogy, a variety of andalusite, occurring in long, tapering crystals in clay-slate. They have the axes and angles of a different color from the rest of the crystals, owing to a regular arrangement of impurities in the interior.

MacLEAN, măk-lān', **George Edwin,** American educator: b. Rockville, Conn., 31 Aug. 1850. He was graduated at Williams College in 1871 and at Yale Theological Seminary in 1874; from 1877 to 1881 was pastor at Troy, N. Y.; studied in Germany; and in 1883 became professor of English language and literature at the University of Minnesota. He was chancellor of the University of Nebraska, 1895–99, and from 1899 to 1911 was president of the University of Iowa. In 1913 he was sent by the United States Bureau of Education to make a study of the English universities and colleges. His writings include 'A Chart of English Literature' (1892); 'Old and Middle English Reader' (1893); and 'A Decade of Development in American State Universities' (1898); 'Present Standards of Higher Education in the United States' (1913); 'Studies in Higher Education in England and Scotland, with Suggestions for Universities and Colleges in the United States' (1916). He has edited 'Ælfric's Anglo-Saxon Version of Alcuini Interrogationes Sigewulfi Presbyteri in Genesin' (1883); 'An Introductory Course in Old English,' by Wilkin and Babcock (1888); and 'An Old and Middle English Reader,' by Zupitza (1889).

McLEAN, George Payne, American lawyer and politician: b. Simsbury, Conn., 7 Oct. 1857. He was for a time a reporter on the Hartford *Evening Post,* then studied law, and was admitted to the bar in 1881, and immediately commenced practice in Hartford. In 1883–84 he was a member of the general assembly, where he soon became distinguished for facility in debate and was considered one of the leaders of the Republican party. In 1888 he was elected State senator and in 1900 nominated by his party as governor of Connecticut and elected. Though he was not widely known at the time of his election, his independent position in regard to constitutional reform soon made him prominent; both in his first governor's message and before the constitutional convention, he advocated representation in the

legislature according to population instead of by towns. Though in this he opposed certain elements in his own party, he gained support from a considerable number of Democrats and great personal popularity in the cities. In 1902 he was offered renomination, but declined; in 1903–04 he was a prominent candidate for United States senator. He was elected to the United States Senate in January 1911 and took office on 4 March following. He is the author of what is known as the "Federal Migratory Bird Bill," which became a law on 4 March 1913.

MacLEAN, James Alexander, Canadian educator: b. Mayfair, Ontario, 2 Aug. 1868. He was graduated at the University of Toronto in 1892 and took his A.M. at Columbia in 1893. He was professor of political science at the University of Colorado in 1894–1900; president of the University of Idaho in 1900–13; and since 1913 he has been president of the University of Manitoba, Canada. Author of essays in 'The Financial History of Canada' (1894).

MacLEAN, John, American jurist and statesman: b. Morris County, N. J., 11 March 1785; d. 4 April 1861. He removed with his parents to Warren County, Ohio, in 1799, later went to Cincinnati, where he studied law, and was admitted to the bar in 1807, and commenced practice at Lebanon, Warren County, Ohio. He was a member of Congress 1812–16, and from 1816–22 judge of the Supreme Court of Ohio. In July 1823 he was appointed Postmaster-General, the Post-office Department being then in a very disordered and inefficient condition. Under his administration this branch of the public service was restored to order, and managed with a vigor, method and economy that soon secured an almost unexampled degree of applause and public confidence. In 1829 he became associate justice of the Supreme Court of the United States. In this capacity his charges to grand juries while on circuit are distinguished for ability and eloquence. In the Dred Scott case he dissented from the decision of the court as given by Chief Justice Taney, and expressed the opinion that slavery has its origin merely in power, and is against right and in this country is sustained only by local law.

McLEAN, John, American educator: b. Princeton, N. J., 1800; d. there, 1886. His whole life was spent in Princeton. He was graduated from the college there in 1816, became tutor in the institution in 1818 and was a member of the faculty till 1868, when he resigned the presidency, which he had held from 1854. He published 'Lecture on a Common School System for New Jersey' (1829), which in later years had much influence in the establishment of such a system; 'History of the College of New Jersey' (1877), and 'The True Relations of the Church and the State to Schools and Colleges' (1853).

MACLEAN, John, Canadian Methodist clergyman and author: b. Kilmarnock, Scotland, 2 Oct. 1851. He was educated at Victoria University, Cobourg, Ontario, and at the Wesleyan University, Bloomington, Ill. He served as a missionary among the Blood Indians near Macleod, Alberta, in 1880–89, and was pastor at Moose Jaw, Saskatchewan, in 1889–92; later filling pastorates at Port Arthur; and at Neepawa and Carman, Manitoba. In 1902–06 he edited *The Wesleyan,* and has since been stationed at Morden, Manitoba. In 1888 he was appointed a member of the Northwestern Board of Education. Author of 'The Indians of Canada' (1892); 'The Destiny of the Human Race'; 'The Hero of the Saskatchewan'; 'Better Lives for Common People'; 'Science and the Bible,' etc.

McLEAN, Norman, British Orientalist: b. Lanark, Scotland, 2 Oct. 1865. He was educated at the University of Edinburgh and at Christ College, Cambridge. He was examiner in classics at Edinburgh University in 1891–94; examiner for Oriental Languages Tripos in 1895–96, 1899–1900, 1909–11, and for theological Tripos in 1896–97, 1901–02, 1908–09, 1911–12. He was Fellow, senior tutor and Hebrew lecturer at Christ's College, Cambridge, and university lecturer in Aramaic. He is engaged with Rev. A. E. Brooke in the preparation of a larger Cambridge edition of the Septuagint. He was one of the editors of 'Ecclesiastical History of Eusebius' (1896).

McLEAN, Sarah Pratt. See GREENE, SARAH PRATT McLEAN.

MACLEAN, William Findlay, Canadian journalist and legislator: b. Ancaster, Ontario, 10 Aug. 1854. He was educated at the University of Toronto and in 1890 founded the Toronto *World* of which he is still editor and proprietor. He was elected to the Canadian Parliament for East York in 1892 and since 1904 has been returned from South York. He is an advocate of government ownership of railways and of a two-cent passenger rate on certain Canadian railways. He was a delegate to the Imperial Press Conference at London in 1900.

McLELLAN, James Alexander, Canadian educator: b. Shubenacadie, Nova Scotia, 1832; d. 1902. He was educated at the University of Toronto and spent many years in teaching. He was appointed high school inspector for Ontario in 1871 and was credited with considerably improving the standards of the schools under his care. He became director of normal schools in 1875 and of teachers' institutes in 1885. From 1890 he was principal of the School of Pedagogy, subsequently the Ontario Normal School. Author, with Prof. John Dewey, of 'Applied Psychology'; 'The Psychology of Numbers' (1896; 4th ed., 1909).

McLEMORE'S COVE, Ga., Military Operations at. While there was little fighting in the cove, the operations there in September 1863 were vital to the success of General Rosecrans' campaign for Chattanooga. The failure of General Bragg's excellent combinations immediately increased the difficulty of interposing his army between the Union army and Chattanooga and, in the end, made it impossible.

Lookout Mountain bounds the cove on the west. Following its eastern base from Chattanooga southward, it is 24 miles to Stevens' Gap, over which the Fourteenth corps, General Thomas', which constituted the centre of Rosecrans' army, crossed Lookout from the west into the cove. Eight miles beyond is Dougherty's Gap, from which point Pigeon Mountain, run-

ning northeastwardly, forms the eastern boundary of the cove. The triangular area thus enclosed is from five to eight miles wide, the mouth opening toward Chattanooga, and contains from 80 to 100 square miles. General Bragg, in evacuating Chattanooga, because of Rosecrans' flank movement, had conducted his army by way of Rossville and Lee and Gordon's Mill and established it behind Pigeon Mountain, from a point near Lee and Gordon's to Lafayette, 13 miles beyond. From this position of his army there were four gaps through which roads led into McLemore's Cove. Opposite Lafayette was Dug Gap, to the south of it Blue Bird and to the north Cattlett's and Wrothen's. Dug Gap was directly opposite Stevens' Gap. The Chickamauga Creek rises near Dougherty's Gap and runs northward through the cove.

The right of the Union army, A. McD. McCook's Twentieth corps, with the cavalry corps, Gen. D. S. Stanley, crossed Lookout at Valley Head, 42 miles south of Chattanooga, and descended south of Dougherty's Gap. The left of this army, Crittenden's Twenty-first corps, had crossed the north point of Lookout near Chattanooga and, leaving one brigade in that city, had advanced to the vicinity of Lee and Gordon's Mill. It there formed the left of the Union army. The centre corps was at Stevens' Gap, 15 miles distant, the right corps about 25 miles beyond that point, with the cavalry still farther south. This separation of Rosecrans' army was made necessary by the fact that there were no roads practicable for wheels crossing Lookout Mountain in closer proximity.

General Bragg was fully informed of the movements, and the isolation of the several Union corps. These movements, which placed each corps beyond supporting distance from either of the others, were immediately rendered still more precarious by reports received from General Sheridan on the extreme right that the enemy was retreating toward Rome, which led General Rosecrans to order pursuit. General Thomas urged active concentrations instead, but was overruled.

General Bragg, from his position behind Pigeon Mountain, commanding the four gaps opening directly upon the advance of the centre across the cove, was in most favorable position for first striking General Thomas with effect, and then turning upon either of the wings before they could attain supporting distance. Had Bragg's orders been promptly and vigorously executed the situation of the Union army would have been critical.

The night of the 9th, Negley's division, forming the Union advance from Stevens' Gap along the road leading through Dug Gap to Lafayette, encountered the enemy in the gap, and later in the night it was ascertained that a strong force was concentrating there.

General Bragg, in developing his plan, had advanced Hindman's division from the Lafayette side of the mountain, and ordered General Hill to send Cleburne to co-operate. Late at night Hill sent word that Cleburne was sick, the gaps blocked with felled trees and that the movement was, therefore, impracticable.

Early the next morning General Buckner from the extreme right was ordered to advance into the cove to support Hindman. This junction was not effected until the afternoon of the 10th. Meantime, Negley had withdrawn his division from Dug Gap and was manœuvering in defense. Hindman, instead of attacking as ordered, sent a staff-officer to Bragg at Lafayette to suggest a change of plan. This officer reached Bragg at midnight and was at once directed to return and notify Hindman to carry out the orders he had received. Cleburne was then in Dug Gap, and had promptly cleared away obstructions. Walker's reserve corps was ordered forward to join Cleburne in the attack, and all impatiently waited for Hindman's guns. Bragg had ordered seven divisions to co-operate in this movement against Thomas' three which composed the Union centre. Hindman did not attack until afternoon. At that time Baird's division had arrived from Stevens' Gap to support Negley, and by brilliant movements in retreat, with some sharp fighting by T. R. Stanley's and Starkweather's brigades, the two divisions with their trains were withdrawn in perfect order to Bailey's crossroads, a strong strategic position in front of Stevens' Gap, where Brannan's division, which had completed the crossing of Lookout, was within easy supporting distance. Thus Bragg's attempt to crush the Union centre failed. For this failure he held Hill and Hindman responsible.

Bragg then withdrew the forces operating against the Union centre to Lafayette, and at once dispatched Polk's and Walker's corps with orders to attack Crittenden's corps in the vicinity of Lee and Gordon's Mill. This corps at the time was known to Bragg to be divided, with one of its three divisions near Ringgold. Polk was urged to attack with the greatest promptness. He, however, was led to believe that a general attack on his column was about to be delivered. Instead of carrying out Bragg's orders, he therefore awaited attack and sent for the whole of Buckner's corps as reinforcements. This delay enabled Crittenden to unite his forces, cross the Chickamauga, and take a strong position on the bluffs overlooking that stream at Lee and Gordon's. Thus Bragg's attempt to crush the Union left failed, as his movement on the centre had miscarried. For this Polk was held responsible.

Meantime the Union right was withdrawing under orders to join the centre at Stevens' Gap. Rosecrans had early discovered that Bragg, instead of retreating, was concentrated for battle, and that Johnston from Mississippi and Longstreet from Virginia were about to join him. General Rosecrans in his report says: "It then became a matter of life and death to effect the concentration of the army." The flanks of the army were 40 miles apart by the nearest practicable roads, and the centre was obliged to remain near Stevens' Gap until the right corps arrived.

General Bragg's third plan, for which orders were promptly given, was to move his army down the valley of the Chickamauga, cross at the bridges and fords below Lee and Gordon's Mill, sweep up the valley, attack Crittenden, the left of Rosecrans' army drive it back on the centre, and thus, interposing between the Union army and Chattanooga, push it back into the mountains and regain that most important city. Rosecrans, however, by an undiscovered night march moved his centre and right from the cove to the left of Crittenden, and at sunrise of 19 September had interposed between Bragg and Chattanooga on the field of Chickamauga.

These movements of the opposing armies brought on the battle of Chickamauga (q.v.).

H. V. BOYNTON.

McLENNAN, John Cunningham, Canadian physicist: b. Ingersoll, Ontario, 14 April 1867. He was educated at the universities of Toronto and Cambridge. From 1899 he was connected with the faculty in physics at Toronto, and since 1907 he has been professor of physics and director of the physical laboratory there. He was president of section III of the Royal Canadian Society in 1910; was elected to the Royal Society, London, in 1915; and in 1916–17 he was president of the Royal Canadian Institute. He was Dominion lecturer on the metric system in 1906; and is author of papers on radioactivity, electrical conduction of gases and spectroscopy.

McLENNAN, măk-lĕn'ăn, **John Ferguson,** Scottish sociologist: b. Inverness, 14 Oct. 1827; d. Hayes Common, Kent, 16 June 1881. He was educated at King's College, Aberdeen, and Trinity College, Cambridge, and after two years spent in journalism in London returned to Edinburgh, and was called to the bar in 1857. His first important publication was the article on 'Law' in the eighth edition of the 'Encyclopædia Britannica' (1857), and in 1865 he elaborated some of its speculations in 'Primitive Marriage: an Inquiry into the Origin of the Form of Capture in Marriage Ceremonies.' In 1876 his 'Primitive Marriage' was republished with 'Kinship in Ancient Greece' and other matter under the title of 'Studies in Ancient History.' An unfinished work by him, directed against Sir H. S. Maine's patriarchal theory, was completed and published in 1885 by his brother under the title of 'The Patriarchal Theory.' In 1896 a second series of 'Studies in Ancient History,' treating of the origin of exogamy, was edited by his widow and Arthur Platt. Though his views are still and probably will remain matter of controversy, the study of primitive society received a powerful impetus from his important investigations.

McLEOD, măk-loud', **Alexander,** American Presbyterian clergyman: b. Island of Mull, Scotland, 12 June 1774; d. New York, 17 Feb. 1833. He came to the United States in 1792 and was graduated at Union College in 1798. He was licensed to preach in 1799 and was ordained in charge of the First Reformed Presbyterian Church of New York and of a church in Wallkill, N. Y. He soon resigned from the Wallkill charge, but retained his New York pastorate the remainder of his life. He was for a time an editor of the *Christian Magazine.* Author of 'Negro Slavery Unjustifiable' (1802); 'Ecclesiastical Catechism' (1807); 'View of the Late War' (1815); 'The American Christian Expositor' (2 vols., 1832–33), etc.

McLEOD, Archibald Angus, American railway official: b. Compton County, Quebec, Canada, 1848; d. 1902. Early in life he came to the United States, where he became a rodman on the docks of the Northern Pacific Railway at Duluth, and in 1885 manager of the Elmira, Cortland and Northern line. He then was successively acting general manager (1886), vice-president and general manager (1887) and president (1890) of the Reading system. His consolidation of the Lehigh Valley and Jersey Central with the Reading, under Reading control, for the purpose of controlling the carrying trade of the coal fields, resulted in the Reading passing into the hands of three receivers, of whom McLeod was one.

MacLEOD, Donald, Scottish Presbyterian clergyman and author: b. Campsie, Stirlingshire, 18 March 1831; d. 17 Dec. 1911. He was a brother of Norman MacLeod (q.v.), whom he succeeded as editor of *Good Words,* 1872–1905. He was educated at the University of Glasgow. He held pastorates at Lauder (1858), Linlithgow (1862) and Glasgow (1869–1909), and, like his brother, was chaplain to Queen Victoria. He published 'Sunday Home Service' (1885); 'Christ and Modern Society' (1893), etc.

MACLEOD, Fiona, pseudonym of William Sharp (q.v.), Scottish poet and novelist: b. Paisley, 12 Sept. 1856; d. Sicily, 13 Dec. 1905. A part of his youth was spent in the Hebrides and in the islands of Iona and Arran. His stories and poems attracted great attention by reason of their freshness of treatment and originality of conception. Under his own name he published a number of works, including poems, stories, and biography, beginning with a life of Rossetti in 1882. In 1893 he began writing mystical prose and verse under the pen name of 'Fiona Macleod,' and cleverly concealed his identity, going the length of supplying a fictitious biography of the lady, to 'Who's Who,' and corresponding, through his sister, with her admirers. He also wrote concurrently, under his own name. Among works published as Fiona Macleod are 'Pharais' (1895), a romance; 'The Mountain Lovers' (1895); 'The Sin-Eater and Other Tales' (1895); 'The Washer of the Ford' (1896); 'Green Fire' (1896); 'From the Hills of Dream' (1896); 'The Laughter of Peterkin' (1897); 'Through the Ivory Gate' (1901); 'The Silence of Amor' (1902).

McLEOD, Hugh, American soldier: b. New York, 1 Aug. 1814; d. Dumfries, Va., 2 Jan. 1862. He was graduated at West Point in 1835 and served on frontier duty at Fort Jesup, La., until June 1836, when he resigned. He then joined the Texans in their struggle against Mexico, and afterward practised law at Galveston, Tex. As brigadier-general of the Texas militia he was appointed by President Mirabeau B. Lamar of Texas to the command of an expedition planned to secure an establishment of trade between Texas and Mexico in 1841, but was taken prisoner by the Mexicans and not released until the following year, when the United States government intervened in his behalf. He served in the Texas Congress in 1842–43, fought through the Mexican War and was a member of the State legislature after the annexation to the United States. He joined the Confederate army in 1861 and served on the Rio Grande and in the first Virginia campaign.

McLEOD, John, Canadian pioneer: b. Stornaway, Island of Lewis, Scotland, 1788; d. Montreal, 24 July 1849. He was engaged in the service of the Hudson Bay Company in 1811, mustering men for the company's service in the Hebrides and conducting them to Canada. In 1812–16 he built the trading posts of the company for 500 miles westward of the Red River

establishment. He was the first man known to have traversed the continent from Hudson Bay to the Pacific coast. He was in charge of Norway House, the most important fur-trading establishment in that part of the country, in 1826–30. He was afterward in charge of the Saint Maurice district, extending from Hudson Bay to the Saint Lawrence. He was a man of wide influence among both the whites and the Indians and accomplished an important work in opening the northwest for settlement.

McLEOD, Malcolm, Canadian lawyer, son of John McLeod (q.v.); b. Green Lake Saskatchewan, 21 Oct. 1821; d. Ottawa, September 1898. He was educated at Edinburgh, Scotland, later studied law in Montreal and in 1845 was admitted to the bar. He engaged in practice, was district judge for the counties of Pontiac and Ottawa in 1873–76 and in 1887 he became Queen's counsel. He was prominently connected with the projects of annexation of the Northwest territory to Canada and the building of a railroad to the Pacific. He was instrumental in securing the revocation of the Hudson Bay Company's charter, taking the matter to the British Colonial Secretary when the Canadian Parliament refused to act. Author of 'The Peace River' (1872); five pamphlets on 'The Pacific Railway' (1874–80); 'The Problem of Canada' (1880).

MacLEOD, Norman, Scottish Presbyterian clergyman: b. Campbelltown, Argyleshire, 3 June 1812; d. Glasgow, 16 June 1872. Educated at Glasgow, Edinburgh and in Germany, he became minister first of London. At the Scottish Church Disruption in 1843 he remained in the Establishment, and became minister of Dalkeith in the same year. There he published his first work, 'The Earnest Student,' and became editor of the *Edinburgh Christian Magazine.* In 1851 he became minister of the Barony parish, Glasgow, where he labored with increasing popularity for the rest of his career. In 1857 he was appointed one of the queen's chaplains for Scotland. He became editor of *Good Words* in 1860 and continued in that post till his death. In 1867 he visited India, and in 1871 published 'Peeps at the Far East.' In 1869 he was moderator of the General Assembly of the Church of Scotland. Consult MacLeod, D., 'Memoir of Norman MacLeod' (1872).

MACLEOD, Canada, village and capital of Macleod District, Alberta, on Old Man's River, about 100 miles south of Calgary, and on the Canadian Pacific Railway. It is situated in a rich agricultural and coal-mining region, has natural gas, stone quarries, and deposits furnishing materials for the manufacture of cement and of bricks. It has a considerable trade in grain. The village is growing rapidly and is a post of the Royal North West Mounted Police. Pop. 2,000.

MACLISE, mą-klēs', **Daniel,** English painter: b. Cork, 1806; d. Cheyne Walk, Chelsea, 25 April 1870. He became a student at the Royal Academy in 1828, and began to exhibit in 1829, but it was not until 1833 that he established his reputation with his picture of 'Snap Apple Night.' Three years after he was elected an associate, and in 1840 he became a full member of the Royal Academy. Maclise was commissioned to paint for the new Houses of Parliament, and produced 'The Spirit of Chivalry'; 'The Spirit of Religion,' and the two great paintings of the 'Meeting of Wellington and Blücher after Waterloo,' and the 'Death of Nelson' (1858–64), for which patriotic paintings he refused all remuneration. Among his best-known pictures are 'Merry Christmas in the Baron's Hall'; 'The Ordeal of Touch'; 'The Marriage of Strongbow and Eva'; the 'Play Scene in Hamlet'; the 'Banquet Scene in Macbeth,' etc. His sketches, book illustrations, humorous drawings and outline portraits were very numerous. He declined the presidency of the Academy in 1866. His works show great fertility of invention, skill in composition and excellence in drawing, but his color is coarse, and his pictures are sometimes disagreeable unless seen from a distance. His mural paintings are now recognized to be the greatest historical paintings of their kind ever produced in England. Consult O'Driscoll, 'Memoir of Daniel Maclise' (1871).

McLOUGHLIN, măk-lŏk'lĭn, **John,** Canadian pioneer and fur trader: b. Rivière du Loup, Lower Canada, 19 Oct. 1784; d. Oregon City, 3 Sept. 1857. He was educated in Canada and at Edinburgh, Scotland, studied medicine and in early manhood returned to Canada, where he entered the Northwest Company and was placed in charge of Fort William, the chief depot of the company, situated at the mouth of the Kaministiquia River on Lake Superior. Upon the consolidation of the Northwestern and the Hudson Bay companies, in 1821, Dr. McLoughlin was appointed chief factor of the company in the Oregon country. Arriving overland at Astoria in 1824 he founded Fort Vancouver, which, situated advantageously near the confluence of the Columbia and Willamette rivers, became the headquarters of the company beyond the Rockies. When Dr. McLoughlin established the fort the Indians were so hostile that it was unsafe for parties of less than 60 men to travel the Columbia River, but under his management of the company's affairs it became safe for two men to traverse the distance between Oregon City and Fort Hall. In the entire period of his administration, from 1824 to 1846, there were no Indian wars in the Oregon country, although they broke out in 1847, the year after his resignation. He made Fort Vancouver a haven of refuge to emigrants arriving after the perilous journey overland, furnishing goods and provisions on credit and caring for their sick in direct opposition of the company's policy, which was to keep the land wild for the wild fur-bearing animals. During McLoughlin's administration the Oregon country was in the condition of joint occupancy by the United States and Great Britain. His courageous and humanitarian method of dealing with the situation, recognizing the equal rights of the American settlers with those of the British Fur-trading Association, undoubtedly went far toward preventing war between the British and American nations. However, the strictures upon his methods by Sir George Simpson, governor-in-chief of the Hudson Bay Company, culminated in an order to render no further aid to immigrants, and McLoughlin resigned rather than obey, although it cost him his income of $12,000 a year. His resignation took effect in 1846, and he then retired to Oregon City where he had

extensive and partially improved land claims. Litigation over his claims embittered his last years, but after his death the land was restored to his heirs. He became an American citizen in 1848. The McLoughlin Institute was dedicated to his memory at Oregon City in 1907, and he is generally known as the "Father of Oregon." Consult the 'Reports' of the Washington Historical Society, the Oregon Historical Society and the Oregon Pioneer Association; Dye, E. E., 'McLoughlin and Old Oregon' (1900; 8th ed., 1913); Holman, F. V., 'Dr. John McLoughlin, the Father of Oregon' (1907).

McLOUGHLIN, Maurice Evans, American tennis champion: b. Carson City, Nev., 1890. He won the championship of the Pacific Coast, played in the East in 1908–09 and in 1909 and 1911 he competed for the Davis cup in Australia, but unsuccessfully. He won the national championship at Newport in 1912; and in 1913 was leader of the American team that captured the Davis cup from England. He was victor at Longwood and won the New York State championship in 1914. His defeat of Brookes and Wilding in singles made him world champion. Author of 'Tennis as I Play It' (1915).

McLOUTH, măk-lowth', **Lawrence Amos,** American educator and author: b. Ontonagon, Mich., 19 Jan. 1863. He was educated at the universities of Leipzig, Heidelberg and Munich. He was instructor in German at the University of Michigan in 1892–95; and since 1895 has been professor of Germanic language and literature at New York University. He has edited German texts, is author of numerous articles on literature, philology and pedagogy, and of 'Verses' (1910).

MACLURE, măk-lūr', **William,** American geologist: b. Ayr, Scotland, 1763; d. San Angel, near the city of Mexico, 23 March 1840. In 1796 he visited the United States, and in 1803 was in Europe as one of the commissioners to settle the claims of American citizens against France for spoliations during the revolution in that country. On returning to America he engaged with zeal in the extraordinary private undertaking of a geological survey of the whole country. Depending on his own resources and observations at a time when geology was unknown as a science, and few could appreciate his motives, he visited almost every State and Territory, crossing and recrossing the Alleghanies no fewer than 50 times. His first communication to the public was a memoir entitled 'Observations on the Geology of the United States, explanatory of a Geological Map,' read before the American Philosophical Society, 20 Jan. 1809, and published in Vol. VI of their 'Transactions.' He still continued his explorations, and on 16 May 1817 presented another memoir to the society, published in their 'Transactions,' and also in a separate volume. The former publication was six years prior to that of the geological map of England prepared by William Smith, a production which gave him the title of father of English geology. To Maclure is equally due the title of father of American geology. His publications attracted much attention to the science. He now settled in Philadelphia and gave his books and collections to the Academy of Natural Sciences of which he was president from 1817 till his death. He lived in Spain, 1819–24, where he attempted to found an agricultural college, and returning in 1824 to the United States attempted to carry out a similar scheme in the New Harmony settlement in Indiana. Several distinguished naturalists from Philadelphia joined him in this enterprise, but the scheme failed. After 1828 he lived in Mexico, always, however, with the intention of returning to the United States, and with his interest in the progress of scientific education there unabated. While in Mexico he wrote 'Opinions on Various Subjects,' devoted mainly to political economy (1837).

McMAHON, măk-mä'hŏn, Sir **Arthur Henry,** British soldier and administrator: b. 28 Nov. 1862. He was educated at the Royal Military College at Sandhurst, joined the 8th Regiment in 1883 and in 1885 entered the Indian Staff Corps and joined the 1st Sikhs, Punjab Frontier. He became affiliated with the Indian Political Department in 1890 and served as political agent on various missions until 1901, when he became Revenue and Judicial Commissioner at Beluchistan. He was an arbitrator on the boundary between Persia and Afghanistan in Seistan and also served as British Commissioner to the Seistan Mission in 1903–05. He was Foreign Secretary to the Government of India in 1911–14; was British Plenipotentiary for the treaty regarding Tibet between England, China and Tibet in 1913–14. In 1914–16 he was High Commissioner of Egypt. He was knighted in 1906.

McMAHON, James, American mathematician: b. County Armagh, Ireland, 22 April 1856. He was graduated at the University of Dublin in 1881. In 1897–1902 he was professor of science at Central College, Huntington, Ind., and in 1902–05 he was president of that institution. Since 1905 he has been president of the Illinois President Lincoln College.

MacMAHON, Marie Edme Patrick Maurice de, Duke of Magenta and Marshal of France: b. Sully, Saône et Loire, 13 June 1808; d. near Montargis, 17 Oct. 1893. He was descended from an Irish family that went into exile with James II, and was educated at the military college of Saint Cyr; served with distinction in Algeria; became brigadier-general in 1848; received command of a division during the Crimean War, and assisted in storming the Malakoff; was appointed to the Senate in 1856; took part in the campaign of 1859 against Austria, and won the battle of Magenta by his prompt handling of the left wing and was rewarded by a marshal's baton and a dukedom; and in 1864 became governor-general of Algeria. At the outbreak of war between France and Germany (1870) MacMahon was placed in command of the First army corps, which was defeated at Weissenburg and Wörth, and finally fell back upon Châlons. Here he rallied his forces, and proceeded northeastward to relieve Bazaine, who was besieged in Metz, but he was pursued by the Germans, shut up by them in the town of Sedan and wounded in the battle before the final surrender with 81,000 men. After the armistice with Germany he was employed by the Versailles government in putting down the commune, and in 1873 was elected President of the republic, a position which he occupied until 1879. Consult Daudet, 'Souvenirs de la présidence du Maréchal de MacMahon' (Paris 1880); 'Le maréchal de MacMahon' (ib. 1883);

LaFarge, 'Histoire complète de MacMahon, maréchal de France, duc de magenta' (ib. 1898).

MacMANUS, măk-măn'ŭs, **Seumas,** Irish novelist and writer of short fiction and verse: b. Donegal, 1868. He was educated at a mountain school in Donegal and engaged in teaching. He soon became known for his prose and verse contributions to periodicals, dealing with the traditions and folklore of Ireland. He visited America in 1899 and afterward his contributions appeared in many leading American periodicals. He has since made frequent lecture tours in America. Author of 'Through the Turf Smoke' (1899); 'Donegal Fairy Tales' (1900); 'Ballads of a Country Boy' (1905); 'The Leadin' Road of Donegal' (1900); 'Irish Nights'; 'Yourself and the Neighbors' (1914); 'Ireland's Case' (1917), etc. Among his plays are 'The Woman of Seven Sorrows'; 'Orange and Green'; 'Rory Wins'; 'Nabby Harren's Matching,' etc.

McMASTER, John Bach, American historian: b. Brooklyn, 29 June 1852. He was graduated from the College of the City of New York in 1872, studied civil engineering, and 1877 became instructor of civil engineering at Princeton. In 1883 he published the first volume of his 'History of the People of the United States,' and the same year was appointed professor of American history in the University of Pennsylvania. His 'History,' of which eight volumes were published in 1913, has become a standard work. It covers a period reaching from the close of the Revolution (1783) to the outbreak of the Civil War,— less than 100 years, but a crucial time for the shaping of the country. The account of the formative time, the day of the pioneer and the settler, engages his particular attention and receives his most careful treatment. He strives to give a picture of social rather than constitutional and political growth; and tells the story of national evolution with admirable lucidity and simplicity of style, and always with an appeal to fact precluding the danger of the subjective writing of history to fit a theory. His other works are 'Benjamin Franklin as a Man of Letters' (1887); 'With the Fathers, Studies in American History' (1896); 'Origin, Meaning and Application of the Monroe Doctrine' (1897); 'A School History of the United States' (1897); 'A Primary School History of the United States' (1901); 'Daniel Webster' (1902); 'Brief History of the United States' (1903); chapters 9, 11 and 12, Vol. VII, 'Cambridge Modern History' (1903); 'Struggle for the Social, Political and Industrial Rights of Man in America' (1903); 'Life and Times of Stephen Girard' (1917); 'The United States in the World War' (1919).

McMASTER, William, Canadian senator and philanthropist: b. Tyrone, Ireland, 24 Dec. 1811; d. Toronto, Canada, 22 Sept. 1887. When 22 years of age he emigrated to Canada, and after several years' experience in a large wholesale firm in Toronto commenced business on his own account. He was elected a member of the legislative council for the Midland division of Canada in 1862, and held this seat until he was called to the Senate by royal proclamation in 1867. He was prominently identified with many public institutions, notably as president of the Canadian Bank of Commerce, member of the senate of the University of Toronto, chairman of the Canadian board of the Great Western Railway and became widely known by his liberal donations to educational and religious institutions, especially those of the Baptist denomination, of which sect he was a member. McMaster University, Toronto, is named in his honor.

McMASTER, UNIVERSITY, Toronto, Canada, is controlled by the Baptist Convention of Ontario and Quebec. It came into existence through the gift of about $1,000,000 by the late Senator William McMaster, of Toronto, but it is really a development of educational work formerly conducted at Woodstock, Ontario. In 1857, under the leadership of the Rev. R. A. Fyfe, D.D., subscribers to the funds of a projected college secured from the Canadian Parliament an act to incorporate "The Canadian Literary Institute," to be located at Woodstock. This school aimed at coeducation and provided both literary and theological courses. In 1875 it secured affiliation with the University of Toronto. In 1881, through the liberality of Mr. McMaster, the Toronto Baptist College was instituted and to it was transferred the theological department of the school at Woodstock. The latter continued its literary work, and, without change of corporation, its name was changed to Woodstock College. Toronto Baptist College was affiliated to the University of Toronto in 1885, but as the result of a further donation by Mr. McMaster it was decided to establish a university to grant degrees in the "several arts, sciences and faculties," as well as in theology. A charter was secured from the legislature of Ontario in 1887, and all the property and rights of the two separate corporations were vested in McMaster University and placed under the authority of the board of governors, 16 in number (exclusive of the chancellor), responsible to the Baptist Convention of Ontario and Quebec. The control of all that pertains to the courses of study belongs to the university senate, a body made up of the members of the board of governors, a certain number representing the teaching faculties and others chosen by the graduates in arts and theology. The senate also nominates, subject to the approval of the governors, the chancellor and members of the faculties. Woodstock College, now a school for young men alone, and Moulton College, for young women, are academical departments of the university. Noteworthy provisions of the act of incorporation are that McMaster University is "a Christian school of learning," the Bible must be included in the course of study, every member of the teaching staff in theology must be a member of a regular Baptist church in Canada and all other teachers members of some "Evangelical Christian Church." The first class in arts was graduated in 1894. The total number of students for the 1914–15 in the three schools of the university was 506.

McMECHEN, măk-mĕk'ĕn, W. Va., city in Marshall County, five miles south of Wheeling, on the Baltimore and Ohio Railroad. It is a residential town and practically a suburb of Benwood. Pop. 2,921.

McMICHAEL, Morton, American journalist, politician and orator: b. Burlington, N. J., 2 Oct. 1807; d. Philadelphia, Pa., 6 Jan. 1879.

After education in the public schools, he studied law at the University of Pennsylvania and became a member of the Philadelphia bar in 1827. The year previously he became editor of the *Saturday Evening Post*, and as an active politician served for several years on the aldermanic bench in Philadelphia. From 1831 to 1836 he was editor-in-chief of the *Saturday Courier* and later was connected with the *Saturday News*, the *Saturday Gazette*, the *North American* and *United States Gazette*, in 1847 consolidating the last two in one journal, of which he was sole proprietor from 1854 until his death. He was mayor of Philadelphia from 1866 to 1869; president of the park commission from its organization in 1867 until his death; and in 1873 was appointed a delegate to the Fourth Constitutional Convention of Pennsylvania. His speeches on public occasions were renowned as models of oratory. A bronze statue was erected to his memory in Fairmount Park.

McMICHAEL, William, American soldier and lawyer: b. Philadelphia, Pa., 4 March 1841; d. New York City, 20 April 1893. The third son of Morton McMichael, he graduated at the University of Pennsylvania in 1859, but left his law studies in April 1861, to enlist as a private when President Lincoln issued his first call for troops. He attained rapid promotion to the grade of colonel and served under Generals Thomas, Rosecrans and Grant. He resumed his interrupted law studies after the war and in 1865 became a member of the Philadelphia bar. During General Grant's first tenure of the Presidency he was appointed solicitor of internal revenue of the Treasury Department, but resigned the office in 1871 on his appointment as United States Assistant Attorney-General. In 1877 he was appointed United States district attorney for the east district of Pennsylvania, but resigned shortly after to go into private practice. President Garfield appointed him a member of the United States Board of Indian Commissioners; in 1882 he was a candidate for Congress on the Independent Republican ticket; and later became a member of the bar of New York City. Like his father, he was renowned for his oratorical gifts.

MACMILLAN, a name for many years prominently identified with English publishing interests. Most important was DANIEL MACMILLAN: b. Upper Corrie, Isle of Arran, 13 Sept. 1813; d. 27 June 1857. He took service with a Cambridge bookseller in 1833, and with Seeley, Fleet street, London, in 1837. He set up in business in London in 1843, but soon removed to Cambridge, and by 1856 had developed a very prosperous trade. He published Hughes' 'Tom Brown's School Days' in 1857; but he was chiefly aided by educational publications and the words of Kingsley and F. D. Maurice. Associated with him from 1843 was his brother, ALEXANDER MACMILLAN (b. 1815; d. 1896), previously a school-teacher at Nitshill, not far from Paisley. In 1863 he was made publisher to Oxford University and in the same year removed the business to London. *Macmillan's Magazine* made its appearance in 1859 and continued publication until 1907. The firm maintains a branch in New York and publishes many university and educational works, as well as considerable fiction, by American authors. They are the publishers of the well-known Golden Treasury and Globe series. Present representatives of the family are SIR FREDERICK MACMILLAN: b. 5 Oct. 1851 (eldest son of Daniel Macmillan). He has been chairman of Macmillan and Company, Ltd., since 1893, is a director of The Macmillan Company, New York, and was president of the Publishers' Association of Great Britain, 1900, 1901, 1911, 1912. GEORGE A. MACMILLAN: b. 1 Aug. 1855 (second son of Alexander Macmillan), is a director of both the English and American establishments of the firm. MAURICE CRAWFORD MACMILLAN: b. 19 April 1853 (second son of Daniel Macmillan) is also a director in both houses of the firm. Consult Hughes, 'Memorials of Daniel Macmillan' (1882); 'Life and Letters of Alexander Macmillan' (1910).

McMILLAN, SIR Daniel Hunter, Canadian administrator: b. Whitby, Ontario, January 1846. He was educated in Canada and in 1864 served with the Canadian Volunteers on the Niagara frontier. He afterward took part in the military operations during the Fenian Raid in 1866; the Red River Expedition of 1870; and in the Northwestern Rebellion of 1885 he was awarded a medal. He was elected to the Manitoba legislature from Winnipeg in 1880, and became a member of the Manitoba government in 1889. Since 1900 he has been lieutenant-governor of Manitoba and Keewatin. He was knighted in 1902, and formerly held the rank of lieutenant-colonel in the Manitoba Grenadiers.

MacMILLAN, Hugh, Scottish Presbyterian clergyman: b. Aberfeldy, Perthshire, Scotland, 17 Sept. 1833; d. 1903. He was minister of the Free West Church, Greenock, N. B., 1878–1901. He was a brilliant writer and preacher, and among his published works may be mentioned 'Bible Teachings in Nature' (1867); 'Holidays in High Lands' (1869); 'The Ministry of Nature' (1871); 'The True Vine' (1871); 'The Mystery of Grace' (1893); 'The Daisies of Nazareth' (1894); 'The Clock of Nature' (1896); 'The Touch of God' (1903); 'The Isles and the Gospel' (1907); several of which have been translated into German, Norwegian, Swedish, French, Italian, etc.

McMILLAN, James, American capitalist and senator: b. Hamilton, Ontario, 12 March 1838; d. Manchester, Mass., 1902. He entered business at Detroit, Mich., in 1855, since which he enjoyed a prosperous career as organizer of the Michigan Car Company, and general manufacturer in the railroad business. He was elected to the United States Senate as a Republican in 1889, and re-elected in 1895 and 1901. He was active in many commercial enterprises and was president of the Detroit Iron Furnace Company, which employed more than 3,000 men. He gave the city of Detroit a thoroughly equipped hospital, costing $250,000, and endowed it with $300,000; to the University of Michigan a fine Shakespearean library, and added to the college buildings McMillan Hall. He bestowed substantial benefactions on several other institutions.

McMILLAN, James William, American solider: b. Clark County, western Virginia, 1826; d. 10 March 1903. At the time of his death he was a member of the board of review of the Pension Bureau. He was brevetted major-general in March 1865, commanded the

1st and 2d brigades of the Nineteenth Army corps, served with Butler in the Gulf campaign, and captured the blockade runner *Fox,* one of the richest prizes of the Civil War.

McMILLAN, Thomas, American Roman Catholic priest of the Missionary Society of Saint Paul the Apostle: b. Ayr, Scotland, 13 June 1851. He is of Irish descent, and when three years old came with his parents to America. In 1874 he entered the Missionary Society of Saint Paul the Apostle. His chief work has been in Sunday schools. In 1886 he instituted a «reading circle» movement, which has extended over all the country. In 1889 he was largely instrumental in bringing together, at New York, a large number of editors, journalists and authors from different parts of the United States to discuss ways and means of making the press more effective in uplifting humanity. This meeting was known as that for the promotion of the «Apostolate of the Press.» In 1892 he was made chairman of the board of studies of the Catholic Summer School of America. In 1897 he was the prime mover in the organization of the «Child Study Congress» held in New York City.

MACMILLANITES. See MACMILLAN, JOHN, AND CAMERONIANS.

MACMILLEN, Francis, American violinist: b. Marietta, Ohio, 14 Oct. 1885. He entered the Chicago College of Music at the age of seven, afterward studying at Berlin, Brussels and Saint Petersburg, under Joachim, César Thomson, Flesch, Auer and others. He received first prize and the Van Hal cash prize at the Brussels Royal Conservatory when 16 years of age. He made his first public appearance in Brussels in 1903, afterward touring England, Belgium, France and Germany. He made his American début at Carnegie Hall, 7 Dec. 1906, and made concert tours of the principal cities of the United States in 1906–07, 1907–08, 1910–11, 1914–15, 1915–16.

McMINNVILLE, măk-mĭn'vĭl, Ore., city, county-seat of Yamhill County, on the Yamhill River, and on the Southern Pacific Railroad, about 55 miles southwest of Portland. It is situated in an agricultural region, in which hops, wheat and fruit are raised extensively. The city has considerable trade in agricultural products, livestock, lumber, wool and some dairy products. The electric-light plant and the waterworks are owned and operated by the city. Pop. 2,400.

McMINNVILLE, Tenn., town, county-seat of Warren County, on the Nashville, Cincinnati and Saint Louis Railroad, about 80 miles southeast of Nashville. It is in the midst of an agricultural region, and in the vicinity is found excellent building stone. Its manufactures are cotton and woolen goods, flour and lumber, foundry and machine-shop products, furniture and dairy products. It is the seat of the Cumberland University Training School. Pop. 2,300.

MACMONNIES, măk-mŭn'ĭz, **Frederick William,** American sculptor: b. Brooklyn, N. Y., 20 Sept. 1863. In his 17th year he became pupil and assistant to Augustus Saint Gaudens, and going to Europe in 1884 he studied at Munich, and later was admitted to the studio of Falguière at the École des Beaux-Arts, and also studied with Antonin Mercie. In 1887 there opened a studio of his own. In 1889 his statue of 'Diana' was honorably mentioned in the Salon, and his 'Nathan Hale' in City Hall Park, New York, and 'James S. T. Stranahan' in Prospect Park, Brooklyn, were much admired in the Salon 1891. His 'Bacchante' (Salon 1894) was purchased for the Luxembourg. He has been prolific in the creations of the chisel, and his work is to be seen in Washington Memorial Arch, New York City, the Soldiers and Sailors' Monument in Indianapolis, in the statues of Prospect Park, Brooklyn, and the Battle Monument at West Point. He executed a number of statues for the Columbian Exposition in the Court of Honor (Chicago 1893). Since 1900 he has devoted himself more and more to painting, in which he exhibits delicacy, freshness of design and a brilliant technique. In 1913 he resumed his work in sculpture. He has received numerous medals. In 1898 he was elected Chevalier of the Legion of Honor, and two years later won the grand prize at the Paris Exposition. He is a member of various national art associations. Consult Taft, L., 'History of American Sculpture' (New York 1903).

MACMULLEN, Wallace, American Methodist Episcopal clergyman: b. Dublin, Ireland, 31 Aug. 1860. He came to the United States with his parents in 1862 and was graduated from the Drew Theological Seminary in 1888, entering the Methodist ministry in that year. He was pastor at Springfield, Mass., in 1888–93; at Grace Church, Philadelphia, in 1893–98; at Park Avenue Church, Philadelphia, in 1898–1902; and at the Madison Avenue Church in 1902–13. Since 1913 he has been professor of homiletics at the Drew Theological Seminary. He is president of the board of managers of foreign missions. Author of 'Captain of Our Faith' (1904).

McMURRICH, James Playfair, Canadian scientist: b. Toronto, Ontario, 16 Oct. 1859. He was graduated from the University of Toronto in 1879, and received his Ph.D. from Johns Hopkins in 1885. From 1884–86 he instructed at that institution in mammalian anatomy. He held a professorship in biology at Ontario Agricultural College (1882–84); at Haverford (1886–89); at Cincinnati (1892–94). From 1889–92 he was docent and assistant professor of morphology at Clark University; professor of anatomy in the University of Michigan (1894–1907), and since then has been at Toronto University. He has published 'Invertebrate Morphology' (1894); 'The Development of the Human Body' (1902), and has edited Sobotta's 'Atlas and Textbook of Human Anatomy' (1906–07); Morris, 'Human Anatomy' (4th ed., 1906).

McMURRY, Charles Alexander, American educator: b. Crawfordsville, Ind., 18 Feb. 1857. He was graduated at the Illinois Normal University in 1876, at the University of Michigan in 1880 and at the University of Halle in 1887. He was principal of the Practice School at the Illinois State Normal University and lecturer at Teachers' College of Chicago in 1899–1900; principal of the Practice School at the Northern Illinois Normal School in 1900–01; and since 1915 he has been professor of elementary education at the George Peabody

College for Teachers, Nashville, Tenn. Author 'Method of Recitation' with his brother, F. M. McMurry (1898); 'Special Method in Reading' (1898); and a series of 'Special Method' textbooks including 'Literature and History' (1898); 'Geography' (1898); 'Natural Science' (2d ed., 1899); 'Manual Arts'; 'Arithmetic' (1906); 'Course of Study in the Eighth Grades' (1906); 'Teacher's Manual in Geography' (1904); 'Pioneer History Stories' (3 vols.); 'Conflicting Principles in Education' (1914); 'Handbook of Practice for Teachers' (1914), etc. He has edited the 'Year Books' of the Herbart Society.

McMURRY, Frank Morton, American educator, brother of Charles Alexander McMurry (q.v.): b. near Crawfordsville, Ind., 2 July 1862. He studied at the universities of Michigan, Halle, Jena, Geneva and Paris. He was professor of pedagogy at the State Normal School, Normal, Ill., in 1891–92; and at the University of Illinois in 1893–94. He was principal of the Franklin School, Buffalo, N. Y., in 1894–95, and was professor of pedagogics and dean of Teachers' College, University of Buffalo, in 1895–98. Since 1898 he has been professor of elementary education at Teachers' College, Columbia University. He was associate editor of the 'Student's Reference Work' (1909). Author of 'Tarr and McMurry Common School Geographies,' with Ralph S. Tarr (1900); 'Method of Recitation,' with C. A. McMurry (1898); 'How to Study and Teaching How to Study' (1909); 'Elementary School Standards' (1913).

McMURTRY, Lewis S., American surgeon: b. Harrodsburg, Ky., 14 Sept. 1850. He was educated at Centre College, Kentucky, and at Tulane University. He specialized in gynecology and abdominal surgery, becoming professor of those subjects in the medical department of the University of Louisville, where he afterward became president of the medical faculty. He is surgeon at the Louisville City Hospital. He is a member of various foreign and American scientific societies and was president of the American Medical Association in 1906–07. He is a contributor to medical journals and also contributed to the 'International Text Book of Surgery.'

McNAB, Sir Allan Napier, Canadian statesman: b. Niagara, Ontario, 19 Feb. 1798; d. 8 Aug. 1862. He entered the navy as midshipman in 1813, but soon abandoned the navy for the army; was present at the capture of Fort Niagara, and commanded the advance guard at the battle of Plattsburg. At the close of the war he studied law and practised in Hamilton, and in 1829 was elected a member of the assembly, and speaker 1837–41. During the insurrection of 1837–38 he commanded the militia on the Niagara frontier, routed the insurgents near Toronto 7 Dec. 1837, and a party of American sympathizers having occupied Navy Island in the Niagara River, whence they were cannonading the village of Chippewa on the Canadian side, he sent a party to seize the steamer *Caroline*, employed to convey them supplies, and having driven the crew ashore, set fire to it and sent it over the Falls. Although the seizure was made on the American side of the river, the act was approved by the British government, and for his services to the Crown during this insurrection McNab was knighted. In 1854 he was Prime Minister under the Earl of Elgin, retaining office for a few months under his successor, Sir Edmund Head. On retiring from the premiership in 1856 he was made a baronet.

McNAIR, măk-nâr', **Frederick Vallette,** American naval officer: b. Jenkintown, Pa., 13 Jan. 1839; d. 1900. He was educated at the United States Naval Academy and served in the *Minnesota* 1857–59. In 1861 he became lieutenant, and during the Civil War took part in the bombardment of Forts Jackson and Saint Philip, the capture of New Orleans and the destruction of the Confederate ram *Arkansas*. He was instructor at the naval academy 1867–68, in 1872 became commander and in 1887 was placed in command of the *Omaha* in the Asiatic squadron. In 1890 he became superintendent of the Naval Observatory. In 1895 he was made admiral, a member of the lighthouse board in 1898, and in July of the last-named year was appointed to take charge of Admiral Cervera and other Spanish prisoners of war. Upon their return to Spain he was appointed superintendent of the naval academy.

MACNAMARA, măk'nạ-mā'rạ, **Thomas James,** British statesman, educator and author: b. Montreal, Canada, 23 Aug. 1861. He went to England at an early age and was educated at Saint Thomas School, Exeter, and at the Borough Road Training College for Teachers. He was engaged in teaching in 1876–92 and was president of the National Union of Teachers in 1896. He was elected to Parliament for North Camberwell in 1900; served as Parliamentary Secretary of the Local Government Board in 1907–08 and to the Admiralty in 1908–15, when he was appointed Financial Secretary to the Admiralty. He has contributed extensively to the periodical press, is author of numerous textbooks and of 'Schoolmaster Sketches' (1896); 'School-room Humor' (1905); 'The Gentle Golfer' (1906); 'Tariff Reform and the Working Man' (1910), etc.

MacNEIL, Carol Brooks, American sculptor, wife of Hermon Atkins MacNeil (q.v.): b. Chicago, Ill., 15 Jan. 1871. She studied at the Art Institute and under Lorado Taft, Chicago, and under MacMonnies and Injalbert, Paris. She exhibited at the Chicago Exposition, 1893; at the Paris salons in 1894, 1895 and 1900; received honorable mention at the Paris Exposition of 1900; and the bronze medal at Saint Louis in 1904.

MacNEIL, Hermon Atkins, American sculptor: b. Chelsea, Mass., 1866. He was graduated at the Massachusetts State Normal School in 1886; and later spent two years in study under Chapu at Julien Academy, and two years under Falguière at the École des Beaux Arts in Paris. He afterward taught for three years at Cornell, and three years also at the Art Institute, Chicago. He won the Roman Rhinehart scholarship in sculpture for 1896–1900. He was awarded the medal in design at the Chicago Exposition in 1893; received the silver medal at the Paris Exposition in 1900; the gold medal at the Buffalo Exposition in 1901; silver medal at the Charleston Exposition in 1902; commemorative medal at Saint Louis in 1904; and the gold medal at the Panama Exposition in 1915. He was engaged in important decorative work for

the expositions at Chicago, Paris, Buffalo and Panama. He executed the spandrels on the portico of the National pavilion at the Paris Exposition, where he exhibited the groups 'The Sun Vow' and the 'Last Act of the Moqui Snake Dance.' The main cascade fountain at the Saint Louis Exposition was his work, and he served on the jury of awards. He is a teacher of modeling at the National Academy of Design, New York. Among his other work may be mentioned 'The Coming of the White Man' (Citv Park, Portland, Ore.); 'McKinley Memorial' (Columbus, Ohio); 'Soldiers and Sailors Memorial' (Whittinsville, Mass.); 'Orville Hitchcock Platt Memorial' (State Capitol, Hartford, Conn.); 'General Washington' (Washington Arch, New York), etc. He was elected to the National Academy in 1906. His work is represented at the Art Institute, Chicago; Peabody Institute, Baltimore; Cornell University; the Metropolitan Museum, New York; and the Johns Hopkins University.

MacNEVIN, or MACNEVEN, William James, American physician: b. Ballynahowne, County Galway, Ireland, 21 March 1763; d. New York, 12 July 1841. When 12 years old he was placed in the care of his uncle, Baron O'Kelly MacNevin, court physician in Austria, and he received his education at the universities of Prague and Vienna, taking his medical degree at Vienna in 1784. He then returned to Ireland and engaged in practice at Dublin. He was a member of the secret society of United Irishmen and his activities in this connection caused his arrest with Thomas Addis Emmet in 1798, and for four years thereafter he was imprisoned. He then joined the Irish Legion under Napoleon in the hope of French intervention in Ireland. After three years he abandoned this hope and emigrated to the United States, establishing himself in practice in New York. He became professor of obstetrics in the College of Physicians and Surgeons in 1808, and was professor of chemistry and materia medica there in 1811. He established in connection with his work as a teacher the first chemical laboratory in New York. He resigned in 1826 and together with several leading physicians founded a new medical school on Duane street, in which he held the chairs of materia medica and therapeutics until the school closed in 1830. He was president of the "Friends of Ireland" and belonged to most of the Irish societies in New York. He was coeditor and contributor to the New York *Medical and Philosophical Journal.* He edited 'Brande's Chemistry' (1831); and was author of 'Rambles through Switzerland' (1803); 'Chemical Examination of the Mineral Waters of Schooley's Mountains' (1815); 'Exposition of the Atomic Theory of Chemistry' (1819), etc.

McNICHOLAS, (Rt. Rev.) John T., O.P., American Catholic prelate: b. County Mayo, Ireland, 1877. He came to the United States when a child; began his studies in the Gesu, Philadelphia, continued them in the Dominican establishments of Kentucky and Ohio and completed them in the University of Minerva, Rome, where, specializing in canon law, he attained the degree of D.D. Returning to America, he became master of novices in the Dominican novitiate, Somerset, Ohio, acting also as professor of philosophy, canon law and homiletics. After holding this office for five years, he became director of the Bureau of the Holy Name in New York City and editor of the *Holy Name Journal,* for eight years devoting himself energetically to the organization of branches of the Holy Name Society in every State of the Union. He is an accomplished linguist, and authoritatively has contributed much to the literature of canon law. In 1916 Dr. McNicholas became assistant to the Dominican General in Rome, where, 18 July 1918, he received the appointment as second bishop of Duluth, Minn.

MACOMB, Alexander, American general: b. Detroit, Mich., 3 April 1782; d. Washington, D. C., 25 June 1841. He entered the United States army in 1799 as a cornet of cavalry, and at the commencement of the war with Great Britain in 1812 held the rank of lieutenant-colonel of engineers and adjutant-general of the army. In January 1814 he was promoted to be a brigadier-general and placed in command of that part of the northern frontier bordering on Lake Champlain. At Plattsburg, on 11 Sept. 1814, he sustained the attack of a greatly superior British force under Sir George Prevost, which, after the defeat of the British squadron on Lake Champlain on the same day, retreated to Canada. For his firmness and courage on this occasion he was commissioned a major-general, and received the thanks of Congress and a gold medal. In 1835 he succeeded to the office of commander-in-chief of the army, which he held until his death. He wrote a 'Treatise on Martial Law and Courts Martial, as Practised in the United States' (1809). Consult Richards, 'Memoir of Alexander Macomb' (New York 1833).

MACOMB, Ill., city, county-seat of McDonough County, on the Chicago, Burlington and Quincy Railroad, about 65 miles northwest of Springfield. It is situated in an agricultural region and in the vicinity are extensive deposits of fire-clay. The first permanent settlement was made about 1841, and the place was incorporated in 1857. The chief manufactures are sewer-pipe, stoneware and pottery. There is considerable trade in farm products, coal and lumber. The Western Illinois State Normal School is located here, and the free public library contains about 10,000 volumes. The government is administered, under a charter of 1872, by a mayor, who holds office two years, and a council. The city owns and operates the waterworks. Pop. 5,774.

MACON, mā'kŏn, **Nathaniel,** American statesman: b. Warren County, N. C., 17 Dec. 1758; d. there, 29 June 1837. He was educated at the College of New Jersey, now Princeton; in 1776 he left college and served during the summer in the New Jersey militia. During the following three years he studied law; then from 1780 he served as a common soldier in the Continental army till the provisional treaty of peace in 1782, refusing any pay or military distinction. When the Constitution of the United States was submitted to the vote of the people of North Carolina, he firmly opposed it, on the ground that it bestowed too much power on the government, and made it in effect independent of the State. He never lost this dislike of the Constitution, and had unlimited confidence in the capacity of the people for self-govenment;

his favorite saying being that "if left alone they would always do what was right." He was a member of the United States House of Representatives 1791–1815, and in 1816 was elected to the Senate, where he served till 1828, when he resigned his seat, having been then a member of Congress for 37 successive years.

MACON, France, capital city of the department of Sâone-et-Loire, on the Sâone River, 45 miles north of Lyons on the Paris-Lyons Railway. A bridge of 12 arches crosses the river to the opposite suburb, Saint Laurent. The cathedral of Saint Vincent, built in the 12th and 13th centuries, was destroyed at the time of the Revolution, but a portion of it is still used as a chapel and the façade and towers remain. There is the modern church of Saint Pierre, a Romanesque structure with two fine spires and a three-naved basilica. Mâcon was the Roman *Matisco Æduorum* and in the 16th century was a stronghold of the Huguenots. It suffered severely in different invasions. It is the seat of a prefecture, and has tribunals of the first instance and of commerce. It has excellent schools and training colleges, and important commercial and manufacturing interests, as well as being a railway centre. It has a large trade in wine, and manufactures supplies for the wine trade as well as being engaged in copper-founding, and making machinery, tools and paper. A statue in the town commemorates the birth there of Alphonse Lamartine, the poet. Pop. about 19,059.

MACON, Ga., city and county-seat of Bibb County, popularly known as the "Heart of Georgia," 86 miles by rail from Atlanta, 191 from Savannah and 125 from Augusta.

It lies on the southeastern edge of the Appalachian mountain wall, on both sides of the Ocmulgee River which pours from the upper plateau with a fall of 90 feet in seven miles above the city. An immense concrete dam 103 feet high spans the river 36 miles up, furnishing hydro-electric current for power and light, operating street cars and factories and lighting the city. An auxiliary steam plant is located in the city for emergency use. The Ocmulgee is spanned by four steel bridges. The river is navigable to the ocean, is open all the year round, and even at low water steamers of three feet draught operate to Brunswick and Savannah, making connection at those points with coastwise and ocean shipping. Macon is the most important railroad centre in the State; six trunk lines with radiating lines give 14 outlets, north, east, south and west; it is the concentration point for tourist trains during the winter season enroute to Florida. A new union passenger station, opened October 1916, cost over a million dollars; it faces Cherry street, the principal thoroughfare of the city.

Macon is in the midst of the cotton section of the State and is the fourth inland cotton market in the United States, well equipped with warehouses and compress, annual receipts over 200,000 bales, a considerable portion of which is manufactured by the numerous cotton mills into cloth, yarns, twine, duck, knitted underwear, hosiery, automobile tire fabrics.

Macon is also the clearing-house for the great fruit belt in central Georgia, within 30 miles of the great peach orchards; an annual average of 4,000 carloads of peaches, plums, pears, cantaloupes and other fruits pass through the city. Three large factories furnish the ice for refrigeration. Within a radius of 50 miles, lies inexhaustible supplies of kaolin, feldspar, fire clays and clays for making brick and terra cotta. The largest brick manufacturing plant in the southeast is located in Macon; every style of brick, tile, sewer pipe and terra cotta is produced here. The Central of Georgia Railway maintains a $2,000,000 shop at Macon where cars are built and locomotives for 2,000 miles of line are maintained. The Georgia, Southern and Florida Railway also has extensive shops at their headquarters of 300 miles of main line. Other railroads also have shops here. The Census Bureau's summary concerning the city, period 1909–14, gives the number of manufacturing establishments in 1914 as 70; persons engaged in manufactures, 4,491; wage earners, 4,047; primary horse power (local) used, 15,883; capital invested, $11,552,000; services, $2,395,000; salaries, $594,000; wages, $1,801,000; materials, $14,025,000; value of products, $18,867,000; value added by manufacture, $4,842,000.

The actual number is greater than stated . one owner is reported for several establishments owned or controlled by one concern. There are a number of establishments manufacturing fertilizer, hardwood, agricultural implements, located outside the city limits which are not included in the foregoing, which are properly Macon investments. The principal manufactures are cotton goods, cloth, yarns, underwear, hosiery, duck, twine and automobile tire fabrics. Cottonseed oil, cake, meal, etc., for food and provender, the seed netting the planter nearly as much as the cotton fibre. Brick, sewer pipe, tile, terra cotta, granite paving block, foundry and machine shops, railroad shops, products, harness, saddlery, agricultural implements, carriages, wagons, furniture, office fixtures, confectionery, barrels, handles, four ice factories, one of them capacity of 500 tons per day.

Macon has eight banks and trust companies with a total capital of $1,695,000; surplus, $958,-500. The annual deposits reach $7,495,000. The largest annual clearings reached in 1912 ($193,000,000), show a slight decrease on account of general depression and European War. Average deposits per capita, $170; average for the United States is only $35.

No city in the country has wider or better parked streets and it is noted for having been the first city in the United States to employ an all auto-fire department. The National and Dixie highways, eastern, western and central routes, all centre in Macon and is the grand central point for State and Interstate tours. Her up-to-date hotels and splendid roads are fast making Macon the mecca of the tourists traveling North and South in summer and winter.

There are two public libraries; Mercer University (for men, Baptist, 1831); Wesleyan Female College (1836, the oldest chartered female college in the world); Saint Stanislau (Roman Catholic, preparatory for the priesthood); Mount DeSales (Roman Catholic); Masonic Home (widows and orphans); State Academy for the Blind (1852), with a valuable library of several thousand volumes; and a

modern granite public building. Macon is the home of the Masonic Order in Georgia and maintains a handsome home for widows and orphans on a 100-acre farm one mile from the city. All other orders are represented: Knights of Pythias Castle is valued at $50,000; Elks Hall, $20,000; Odd Fellows, $25,000.

Recreation facilities include the home of the Georgia State Fair, located in Central City Park, good buildings for agricultural and industrial exhibits, cattle, swine and poultry. Annual attendance, 125,000; Idle Hour Country Club with modern club house and golf links; several resorts for swimming and dancing; four playgrounds with up-to-date apparatus; splendid mile-track; half-mile jog track and winter quarters for circuses and racing stock; the Y. M. C. A. building, four stories, with gymnasium, dormitories and swimming pool; Grand Opera House and four splendid moving picture theatres. All of the principal resorts are reached by street cars and taxi lines. One park is maintained for colored people exclusively.

Tatnall Park, with playground, covers 18 acres. There are numerous street parks all over the city, with shade trees, cement walks and seats. The city has been the recipient of 200 acres of beautiful woodland on the bank of the river two miles out, reached by a boulevard, where a tourist hotel and golf links are to be built. This gift is a part of the late Senator Bacon's estate. There are 29 churches for white people with 14,000 members; many of them handsome buildings, with annexes for Sunday schools, and homes for widows and orphans. The colored population is also well represented in church work and have substantial churches.

The cemeteries include Rose Hill, 150 acres, established in 1840; Riverside, and other smaller ones located on the river bank and famed for their natural beauty, handsome monuments and mausoleums.

The city is governed by a mayor and council of 12 aldermen, with separate commissions of three each in charge of police and fire departments, and a water commission of three. Macon has a modern water plant valued at over $1,000,000, supplying water from the Ocmulgee River, above navigation, on one side, and Tuft Springs on the other. Macon was settled in 1822, incorporated in 1823 and received a city charter in 1832 and was named after Nathaniel Macon, a patriot and statesman of North Carolina. Macon's population in 1900 was 23,000; in 1910, 42,000; in 1915, over 50,000, and this does not include at least 5,000 people who live in the immediate vicinity, enjoying street car, electric light and water service, while within a 50-mile radius of Macon there is a population of nearly 800,000 people who reach the city over a system of the best roads in the county.

MACON, Miss., city, county-seat of Noxubee County, on the Noxubee River, and on the Mobile and Ohio Railroad, about 108 miles east by north of Jackson. The agricultural lands surrounding the city are almost wholly used for the cultivation of cotton. It has cottonseed-oil mills, cotton gins and cotton compress. Its trade is chiefly in cotton. Pop. 2,024.

MACON, Mo., city, county-seat of Macon County, on the Wabash and the Chicago, Burlington and Quincy railroads, about 70 miles west of the Mississippi River and 60 miles south of the Iowa line. Surrounding the city is a fertile agricultural region, well watered and well wooded; and in the vicinity are the largest producing coal fields in Missouri. The industrial establishments are foundries, machine shops, flour mills, wagon and automobile factories, brick yards, cigar factories and works where agricultural implements are made. Here is located the Still-Hildreth Osteopathic Sanitorium, the only institution of its kind in the world, where nervous and mental diseases are treated by osteopathy. Some of its public buildings are the courthouse, the county insane asylum, public and private school buildings, the public library, Federal building, hospital and 10 churches. The city owns and operates the electric-light plant and the waterworks and filtration plant. Pop. 3,584.

MACORIS, mą'kō'rēs', Santo Domingo, seaport on the southern shore of the island of Haiti on Macoris Bay, about 40 miles east of Santo Domingo. The manufacture of sugar and a considerable import and export trade constitute the town's chief activities. A United States consular agent is located here. Pop. about 7,000. Macoris is also the name of a smaller town in northern Santo Domingo, near Santiago.

MACOUN, mą-koon', **John,** Canadian botanist: b. Ireland, 1832. He removed to Canada at 18 and from 1868 to 1879 was professor of botany and geology in Albert College, Belleville, Ontario. In 1882 he became botanist to the Geological and Natural History Survey of Canada and was appointed in 1887 assistant director of the survey. He has published 'Manitoba and the Great Northwest' (1882); 'The Forests of Canada and their Distribution' (1895); an exhaustive report on the Yukon country; and catalogues of Canadian plants and birds.

MACPHAIL, măk'fāl', **Andrew,** Canadian physician, author and editor: b. Orwell, Prince Edward Island, 24 Nov. 1864. He was educated at the Prince of Wales College, McGill University and at the London Hospital. He was principal of the Fanning Grammar School in 1882–85; was engaged in journalism in 1889–93; afterward traveling in the East. In 1895–1906 he was pathologist to the Western Hospital and Verdun Hospital for Insane. In 1906 he became professor of the history of medicine at McGill University. Author of 'Essays in Puritanism' (1905); 'The Vine of Sibmah' (1906); 'Essays in Politics' (1909); 'Essays in Fallacy' (1910); 'The Book of Sorrow' (1916).

MACPHEE, John Joseph, American neurologist: b. Prince Edward Island, Canada, 8 July 1860. He was educated at the Prince of Wales College and at the University of Vermont where he took his M.D. in 1890. He was pathologist at the Post-Graduate Medical College of New York in 1891–94; after which he became professor of nervous and mental diseases at the New York Polyclinic Medical School and Hospital. He is also consulting neurologist at Saint John's Hospital, Brook-

lyn; Beth Israel Hospital, New York; and at Saint Francis' Hospital, New York.

MACPHERSON, măk-fĕr'sŏn, Sir **David Lewis,** Canadian statesman: b. Inverness, Scotland, 12 Sept. 1818; d. 16 Aug. 1896. He was educated at the Royal Academy in his native town, removed to Canada in 1835 and after becoming in 1842 a partner in a forwarding firm in Montreal secured in 1851, with others, a charter for a railway from Montreal to Kingston, the beginning of the Grand Trunk Railway. In 1872 he became president of the Interoceanic Railway Company, the rival to the Canadian Pacific, in competing for the transcontinental railway charter. He sat in the Legislative Council of Canada 1864–67, and in the last-named year entered the Dominion Senate and was elected its speaker in 1880. He was Minister of the Interior 1883–85 and was created K.C.M.G. in 1884.

McPHERSON, Edward, American journalist: b. Gettysburg, Pa., 31 July 1830; d. there, 14 Dec. 1895. In 1848 he was graduated from the University of Pennsylvania, and although he studied law soon gave it up for journalism. He sat in Congress 1858–66, was clerk of the House of Representatives 1868–73, 1881–83, and 1889–91, in 1876 permanent president of the National Republican Convention, and was chief of the Bureau of Engraving and Printing in Washington 1877–88. He edited the Philadelphia *Press* 1877–80, was for some years the American editor of the 'Almanach de Gotha'; edited from 1872 a biennial 'Handbook of Politics'; and the 'New York Tribune Almanac' from 1877 till his death. He was the author of a 'Political History of the United States during the Great Rebellion' (1865); and 'The Political History of the United States during Reconstruction' (1870).

MACPHERSON, James, Scottish author and translator: b. Inverness-shire, 1736; d. 1796. He studied at Aberdeen and Edinburgh. Having published 'Fragments of Ancient Poetry,' translated from the Gaelic or Erse language, a subscription was raised to enable him to collect additional specimens of national poetry. He produced, as the fruit of his researches, 'Fingal, an Ancient Epic Poem,' translated from the Gaelic (1762, quarto); 'Temora and other Poems' (1763), professedly translated from originals by Ossian, the son of Fingal, a Gaelic prince of the 3d century, and his contemporaries. The question of the poem's authenticity gave occasion for violent controversy. It may be concluded that Macpherson's prose epics were founded on traditional narratives current in the Highlands; but the date of the oldest of the lays is comparatively modern, and it is now impossible to ascertain the precise extent of his obligations to Gaelic bards. Macpherson himself never made any serious attempt to vindicate himself against the charge of forgery. He had a life allowance from the government, and was agent to the Nabob of Arcot, having also a seat in the House of Commons, 1780–96. He was also the author of a very inadequate prose translation of Homer's 'Iliad' and of some other works.

McPHERSON, James Birdseye, American soldier: b. Sandusky, Ohio, 14 Nov. 1828; d. Atlanta, Ga., 22 July 1864. He was graduated from West Point in 1853. Appointed brevet 2d. lieutenant of engineers, he was assistant instructor of practical engineering at West Point, 1853–54, and after serving on fortifications and construction duty on the defenses of the harbor of New York and the improvement of the Hudson River (1854–57), was given charge of the construction of Fort Delaware (1857–61) and of the defenses of Alcatraz Island, San Francisco, Cal. He applied for active employment in the field at the opening of the Civil War. In May 1862 he was appointed brigadier-general of volunteers and was with Halleck at the siege of Corinth. For his services on this occasion he was made major-general of volunteers in the following October. He took an important part in the siege and capture of Vicksburg and was in consequence promoted to brigadier-general in the regular army, 1 Aug. 1863. In March 1864 he was made commander of the Department and Army of the Tennessee and performed distinguished services in the campaign of Georgia. In the following July he commanded in the engagement around Atlanta and was killed during a reconnaissance. A statue has been erected in his honor at Washington, D. C., by the men who fought with him in the Army of the Tennessee.

McPHERSON, Kan., city, county-seat of McPherson County, on the Union Pacific, the Atchison, Topeka and Santa Fé, the Missouri Pacific and the Chicago, Rock Island and Pacific railroads, about 150 miles west by south of Topeka. The city is the trade centre of an extensive agricultural region in which the chief products are wheat and corn. It has flour-mills, creameries, grain-elevators, brick and lumber yards. Its trade is chiefly in farm and dairy products and in livestock. Its principal buildings are a courthouse, high school and opera-house. It is the seat of the McPherson College, under the auspices of the German Baptists. The city owns and operates its waterworks and electric-light plant. Pop. 3,546.

McPHERSON COLLEGE. This institution was established at McPherson, Kan., in 1887, and opened its doors for the first time 5 Sept. 1888. Dr. S. Z. Sharp, then a professor in Mount Morris College, Illinois, was the chief promoter. The college is the property of the Church of the Brethren (sometimes called the Dunkers) and the control is exercised by a board of trustees representing the 11 church districts which make up Kansas, Nebraska, Missouri, Oklahoma, Colorado, Utah and Idaho. A local committee of five, in connection with the president of the college, actively supervise the work of the college. While the college is denominational, there are no religious tenets required for admission. The number of students usually ranges from 300 to 400. There are the following departments: college, academy, bible, expression, business, agriculture, domestic science, music, manual arts. The alumni number about 600. There are 22 faculty members. The endowment of the school was small until in 1916, when largely through the efforts of President Kurtz it was raised to over $225,000. This sum is productive. Other gifts are contingent. Each year the contributory congregations observe an educational day on which offerings are raised to sustain scholarships in McPherson College for prospective

ministers and missionaries. There are already some 14 alumni on the mission fields of China and India. The material equipment consists of six buildings, a 10-acre campus and two farms which have been secured for agricultural purposes. On the campus there are Sharp Administration Building, Fahnestock Hall, Arnold Hall, Carnegie library, alumni gymnasium and central heating plant.

McQUAID, m'kwād', **Bernard John,** American Roman Catholic prelate: b. New York City, 15 Dec. 1823; d. Rochester, N. Y., 18 Jan. 1909. After studying in Canada, he completed his course at Saint John's College, Fordham, N. Y., where he was graduated in 1843, and for the next three years held the position of tutor. He studied theology first with the Lazarists of New York City and later at Saint John's College, Fordham, being ordained priest January 1848. Having built churches at Morristown and Springfield, N. J., he was engaged upon one at Mendham when summoned to the newly created diocese of Newark, N. J., 1853. In 1856 Father McQuaid founded Seton Hall College at Madison, N. J., and was its first president, retaining the office for 10 years, and its subsequent success has been eminently due to his indefatigable efforts. He was consecrated first bishop of the diocese of Rochester, N. Y., by Archbishop McCloskey in New York City, 12 July 1868. With characteristic energy he discharged his episcopal duties, the cause of Catholic education ever appealing to him as one of paramount importance. With a view to advancing it he invited the Sisters of Saint Joseph to conduct new parochial schools in his diocese and likewise founded Saint Andrew's Preparatory Seminary.

MACQUARIE (mą-kwär'ĭ) **ISLAND,** British island, the largest of a small group of islands off the south coast of New Zealand and belonging to that country. It is about 4 by 20 miles in extent, is well covered with grassy vegetation and has trees and shrubs in sheltered sections. It was formerly a good seal-hunting ground but the seals were practically exterminated through lack of restrictions in hunting them. Penguins and other sea fowl abound and there are large herds of sea elephants. The island was discovered in 1810 and until the destruction of the seals was visited by numerous sealers. Its only inhabitants at the time it was made a base of the Mawson Expedition of 1911–14 were a few men stationed by a New Zealander for the purpose of rendering sea elephant and penguin blubber. The island is the crest of a submarine mountain, soundings taken 10½ miles east of its shore recording 2,745 fathoms and no bottom. There are several anchorages, but no harbor. There is now a permanent weather and relief station on the island, equipped with a wireless apparatus. Consult Mawson, Sir Douglas, 'The Home of the Blizzard' (2 vols., 1914).

MacQUEARY, mą-kwē'rĭ, **Thomas Howard,** American educator: b. Charlottesville, Va., 27 May 1861. He was graduated from the Episcopal Theological School at Alexandria, Va., in 1886, took orders in the Episcopal Church and in 1887 became rector at Canton, Ohio. His religious views having undergone a radical change he was tried by an ecclesiastical council for denial of miracles and suspended from the ministry for six months. He accordingly resigned from it in September 1891, and was for some time in the Universalist ministry. He returned to college for special work and in 1898 took his M.A. degree at the University of Minnesota, later (1901) finishing the work for the Ph.D. degree in history and economics at the University of Chicago, although he did not publish his thesis and take the degree. He founded Unity House Social Settlement in Minneapolis; from 1900–06 was superintendent of the Parental School in Chicago, and since 1906 has been head of the department of history and head assistant in Soldan High School, Saint Louis, Mo., and teacher of political science in Benton College of Law. He is the author of 'The Evolution of Man and Christianity' (1889); 'Topics of the Times' (1890). He has done considerable lecture work for Chautauquas and other societies.

McQUILLEN, John Hugh, American dentist: b. Philadelphia, Pa., 12 Feb. 1826; d. there, 3 March 1879. He began the study of medicine and dentistry in 1847, engaged in the practice of dentistry in 1849, took his M.D. at Jefferson Medical College in 1852 and his D.D.S. at the Philadelphia College of Dental Surgery in 1853. He became professor of operative dentistry and dental physiology at the Pennsylvania College of Dental Surgery in 1857. In 1863 he was instrumental in securing a charter for the Philadelphia Dental College and he was from that time until his death its dean and professor of physiology. He was president of the American Dental Association, the Pennsylvania Dental Society, the State Odontographic Society. He edited *Dental Cosmos* in 1859–71.

MACRAUCHENIA, măk-rā-kē'nĭ-ą, a three-toed genus of fossil South American herbivorous animals, forming a connecting link between the palæotherium and the camel family; in form they nearly resemble the llama, but were as large as a hippopotamus. Their remains have been gathered nearly completely from the pampas formation of Argentina and Bolivia.

MACREADY, mą-krē'dĭ, **William Charles,** English tragedian: b. London, 3 March 1793; d. Cheltenham, 27 April 1873. He received his education at Rugby, and originally had the intention of adopting one of the learned professions. The change in his career was brought about by his father, a theatrical manager, having fallen into embarrassed circumstances, to relieve which he joined his father's troupe, then acting at Birmingham. He appeared there for the first time in 1810 in the character of Romeo, in which he was successful. On 16 Sept. 1816 he made his first appearance on the London boards, acting Orestes in 'The Distressed Mother,' at Covent Garden Theatre. He did not achieve an immediate triumph in London, but gradually rose in popular favor. His Virginius was the first of his London successes. From the time when he appeared in this part he continued steadily to improve as an actor, and his successes were no longer confined to the lower walks of the profession. In 1826–27 he made his first tour in the United States, making his début at New York on 2 Oct. 1826 as Virginius, and again visited America in 1843,

In 1841 he became a theatre manager of Drury Lane, but met with no success, so that he resigned at the end of the second season. His managership at Drury Lane had brought upon him considerable financial loss, to repair which he made his third visit to America (1848–49). There he was involved in an unfortunate quarrel with the American actor, Forrest, which in May 1849 culminated in a riot at the Astor Place Opera House, New York, at which Macready was appearing as Macbeth, and in consequence was obliged to leave the country. On his return to London he gave some farewell performances, and then retired from the stage in 1851.

McREYNOLDS, măk-rĕn'oldz, **James Clark,** American lawyer, cabinet officer and jurist: b. Elktown, Ky., 3 Feb. 1862. He was graduated at Vanderbilt University in 1882 and from the law department of the University of Virginia in 1884. He engaged in law practice at Nashville, Tenn., attaining a distinguished reputation; and in 1900–03, without relinquishing his practice, he was professor at the Law School of Vanderbilt University. While of Democratic party affiliations he was appointed Assistant Attorney-General under the Roosevelt administration in 1903–07, after which he engaged in law practice in New York. He was on several occasions retained as counsel by the United States in service connected with the application of the anti-trust laws, his part in dealing with the tobacco trust and with the anthracite coal dealers and the railroads being especially prominent. In 1913 he was appointed United States Attorney-General by President Wilson, succeeding Attorney-General Wickersham. While in office the cases of the Union and Southern Pacific Railroad merger, the International Harvester Company, the American Telephone and Telegraph Company, the Reading Company and the New York, New Haven and Hartford, under the Sherman Anti-Trust Law, came under his direction. He was appointed associate justice of the Supreme Court of the United States in August 1914 and took his seat in October.

MACROBIUS, mą-krō'bĭ-ŭs, **Ambrosius Aurelius Theodosius,** Latin author of the 5th century A.D. The country of his birth is uncertain, but it is inferred from the fact that he speaks of Latin as a foreign tongue to him that he was probably a Greek. He was the author of a miscellaneous work entitled 'Saturnalia,' curious for its criticisms, and valuable for the light it throws upon the manners and customs of antiquity; a commentary on Cicero's 'Somnium Scipionis,' in two books, valuable for the exposition it affords of the doctrines of Pythagoras with respect to the harmony of the spheres; and a treatise, 'De Differentiis et Societatibus Græci Latinique Verbi.' Consult Von Jan, 'Macrobius'; and Eyssenhardt, 'Macrobi Opera'; also Wissowa, G., 'De Macrobii Saturnaliorum Fontibus' (Breslau 1880).

MACROCOSM. See MICROCOSM.

MACROCYSTIS, măk'rō-sĭs'tĭs, a genus of brown seaweed of the family *Laminariaceæ,* generally known as giant kelp. It is common throughout the southern temperate zone and along the Pacific Coast of the United States. It has a much-branched root from which rises many filiform simple or branched stems without leaves below, but bearing numerous lance-like leaves above. The stems reach the greatest length known in the vegetable kingdom. Observations by Hooker near the Crozet Islands report specimens fully 700 feet long; and other authorities state that a length of 900 feet is sometimes attained.

MACROTHERIUM, a genus of extinct ungulate mammals, in some cases of gigantic size, found most completely in the Miocene deposits of Europe, but also known from China and western North America. It represents the primitive group *Ancylopoda,* which had a wide geographical range in the Miocene and Pliocene epochs when it became extinct. The structure of the curiously twisted feet so much resembles that of the ground-sloth that for a long time the macrotheres, as well as their companion, but more generalized, genus *Homalodontotherium,* were regarded as edentates. Consult Woodward, 'Vertebrate Palæontology' (1898).

MACRURA. See DECAPODA.

McTYEIRE, măk-tār', **Holland Nimmons,** American Methodist Episcopal bishop: b. Barnwell County, S. C., 28 July 1824; d. Nashville, Tenn., 15 Feb. 1889. He was graduated at the Randolph-Macon College, Virginia, in 1844, and in 1845 entered the ministry, joining the Virginia Conference. In 1846 he was assigned to Saint Francis Street Church, Mobile, Ala., and after serving in the churches at Demopolis, Ala., and Columbus, Miss., he was transferred to the Louisiana Conference. He was editor of the New Orleans *Christian Advocate* in 1851–58, and from 1858 until its publication was interrupted by the Civil War he edited the Nashville *Christian Advocate.* During the war he served as pastor of the church at Montgomery, Ala. He was elected bishop in 1866, and in 1873 he became president of the board of the newly-founded Vanderbilt University. He was senior bishop for some time before his death. Author of 'Duties of Christian Masters' (1851); 'Catechism on Church Government' (1869); 'Manual of Discipline' (1870); 'History of Methodism' (1884); 'Passing Through the Gates' (1889), etc.

MACŪ, mă'koo, a nomadic Indian tribe of the Amazon region. They range through northwestern Brazil, more particularly along the Rio Negro. They are of the lowest type of savages of South America, provide neither shelter nor clothing and plant no crops. They live by hunting and fishing, are hostile and apparently have no connection with other tribes. A report of their condition was made by Theodor Koch-Grunberg in 'Anthropos' (Vol. I, pp. 877–906, 1906).

MacVEAGH, măk'vā, **Franklin,** American cabinet officer, brother of Wayne MacVeagh (q.v.): b. near Phœnixville, Chester County, Pa., 1837. He was graduated at Yale in 1862 and took his LL.B. at Columbia University in 1864. He was admitted to the bar in 1864; and in 1864–66 was engaged in practice in New York. His health failing he went to Chicago in 1866 and there engaged in the wholesale grocery business. After the great fire in 1871 he established the firm of Franklin MacVeagh and Company, wholesale grocers, and he also became connected with various banking and

manufacturing interests. He became president of the Citizens' Association of Chicago in 1874 and was largely responsible for many important reforms. He was Democratic candidate for United States senator against Senator Cullom in 1894 but was defeated. From 1896 he was associated with the Republican party, and in 1909 he was appointed Secretary of the Treasury by President Taft, serving throughout the Taft administration. He was vice-president of the American Civic Association in 1905; served as president of the Chicago bureau of charities and of the Municipal Art League; and was a founder and member of the executive committee of the National Civic Federation.

MacVEAGH, Wayne, American lawyer and diplomat: b. Phœnixville, Pa., 19 April 1833. He was graduated from Yale in 1853 and after studying law was admitted to the bar in 1856. He was district attorney of Chester County 1859–64, became prominent as a Republican leader, and conspicuous in his profession, and in 1870–71 was Minister to Turkey. He was an active opponent of "machine politics" and in 1872 led the Republican opposition to Simon Cameron, his father-in-law. He was chairman of the "MacVeagh Commission" sent by President Hayes to Louisiana in 1877 to act as the President's unofficial representative and aid in adjusting political differences there. He was Attorney-General of the United States, March to September 1881, and was Ambassador to Italy 1893–97. In 1903 he was chief counsel of the United States in the Venezuela arbitration before The Hague Tribunal.

McVICKAR, William Neilson, American Protestant Episcopal bishop: b. New York, 19 Oct. 1843; d. 28 June 1910. He was graduated at Columbia College (1865); and at the General Theological Seminary (1868). He was ordained deacon (1867) and priest (1868). Being elected coadjutor bishop of Rhode Island, 19 Oct. 1897, he was consecrated 27 Jan. 1898, and on the death of Bishop Clark, September 1903, succeeded to the see.

MACWHIRTER, măk-wĕr'tĕr, **John,** Scottish landscape painter: b. Slateford, near Edinburgh, 27 March 1839; d. London, 28 Jan. 1911. He entered the Trustees' Academy, conducted by Robert Scott Lauder at Edinburgh, when 13 years of age, and at 15 made his first exhibition, 'Old Cottage at Braid,' at the Royal Scottish Academy. At 16 he began his annual tours of Europe in search of material for his canvases, his travels eventually covering all parts of Europe and the United States as well. In 1867 he exhibited six pictures at Edinburgh and was elected to the Royal Scottish Academy. He made his first exhibition at the Royal Academy, London, in 1865, and in 1869 he settled permanently in London. He painted some effective landscapes in California in 1877; was elected associate of the Royal Academy in 1879 and Academician in 1893. His landscapes are naturalistic and their popularity doubtless was enhanced by the tinge of literary significance he succeeded in giving them, together with a certain felicity in the selection of their titles. Among his work are 'The Lady of the Woods' (1876); 'The Three Graces' (1878); 'The Lord of the Glen' (1880); 'The Three Witches' (1886); 'Crabbed Age and Youth' (1899); 'The Fallen Giant' (1901). His work is represented in the Royal Academy diploma gallery; the Walker Art Gallery, Liverpool; and in the municipal galleries at Manchester, Dundee, Aberdeen and Hull. Author of 'Landscape Painting in Water Colors' (1901). Consult Spielmann, H. M., 'The Art of John MacWhirter'; Sinclair, W. M., 'John MacWhirter, R.A.' (*Art Journal Annual*, Christmas, 1903).

MACY, Jesse, American historian: b. Henry County, Ind., 21 June 1842. He was graduated from Iowa (now Grinnell) College in 1870. From 1871 to 1885 he was principal of the academy of Iowa College; in 1883–85 was acting professor of history and political science; in 1885–1912 professor of political science, and professor emeritus since 1912. In 1913 he was Harvard Foundation lecturer in French provincial universities. He received the degree of LL.D. from Brown University in 1898, from Grinnell in 1911 and from Oberlin in 1915. He has written 'Civil Government in Iowa' (1881); 'Institutional Beginnings in a Western State' (1883); 'Our Government' (1886); 'A Government Textbook for Iowa Schools' (1887); 'The English Constitution' (1897); 'Political Parties in the United States, 1846–61' (1900); 'Party Organization and Machinery' (1904); 'Comparative Free Government,' with J. W. Gannaway (1915).

MAD ANTHONY, a nickname given to the Revolutionary general, Anthony Wayne (q.v.), on account of the seeming recklessness of his brilliant military feats.

MAD APPLE, the fruit of an American nightshade, especially that called Sodom apple (*Solanum sodomiæ*), the eating of which produces poisonous intoxication.

MAD MULLAH, term applied to Mohammed Ali, the Mandi, or Moslem Messiah: b. Somaliland, 1843; d. Omdurman, 22 June 1885. In his youth Mohammed was initiated into the mysteries of the occult sciences and sorcery. A study of the Koran and the Arab writings followed in the Marabout school. When quite young the future Mullah was taken with the idea of making the pilgrimage to Mecca, and not content with one journey made the sacred visit three or four times. After his last pilgrimage Mohammed returned to Berbera, but met with small success. Establishing himself in a powerful inland tribe, his ascetic practices and bold demeanor gained for him a reputation for sanctity and spiritual gifts. In 1880 he proclaimed himself Mahdi ("the guide," i.e., in the way of salvation), and in 1881 he proclaimed a Jehad or holy war against the infidel and speedily aroused all the latent fanaticism of the fierce Sudanese tribesmen. From 1881–83 he destroyed nearly every force sent against him; and so threatening did his power become that the evacuation of the Sudan was ordered by the Egyptian government, Wolseley's expedition for the relief of Khartum was too late to effect its purpose, the city was stormed in January 1885 and General Gordon murdered. His death is said to have occurred through poison administered at the hands of a woman he had outraged. His successor, Abd-Allah, carried on the struggle, until the power of Mahdism was finally broken at the battle of

Omdurman in 1898. Consult Darmesteter, 'The Mahdi' (London 1885); Hoffmann, 'Mahdithum' (Kiel 1899); Müller, E., 'Beiträge zur Mahdilehre des Islams' (Heidelberg 1901); Wingate, 'Mahdism and the Sudan' (London 1901).

MAD TOM, local name in eastern United States for any of several types of small catfish native to fresh waters. They are long and slender, with mottled skin entirely naked, and have sharp pectoral spines with which a wound about as painful as a bee-sting may be inflicted. There are several varieties, ranging from a few inches to nearly a foot in length. They are known also as stone-cat, owing to their resemblance to the rocky or pebbly bottoms they frequent.

MADÁCH, mŏ'dăch, Emerich, or Imre, Hungarian poet: b. Also-Sztregova, 21 Jan. 1823; d. there, 5 Oct. 1864. He studied law, was a notary in his native country and was also active as an orator and journalist. He wrote on archæology and æsthetics; and both lyric and dramatic verse. His principal works are the two dramatic poems 'Moses' (1860); and 'The Tragedy of Man' (1860). The latter owes much to 'Paradise Lost,' and to 'Faust,' but is yet a remarkable performance. Though strongly contemplative in character, it was successfully presented. There is an excellent rendering in German by von der Lech (1888). Consult Fischer in 'Auf der Höhe' (Vol. XVI, 1885).

MADAGASCAR, măd-a-găs'kạr, an island in the Indian Ocean, since 1896 a French colony. It is separated by the Mozambique Channel from the southeast coast of Africa, the nearest point being 240 miles distant. It is 975 miles long from Cape Saint Mary in the south to Cape Amber in the north, has an average breadth of 250 miles, greatest breadth 360 miles, and an estimated area of 227,750 square miles, being after Greenland, New Guinea, Baffin Land and Borneo, the fifth largest island in the world. The Comoro Archipelago (1,357 square miles) was attached to the island as a province for administrative purposes in 1914.

Topography.— Madagascar consists of an elevated region with an average height of from 3,000 to 5,000 feet overlooked by mountains rising in some cases to nearly 9,000 feet above the sea-level. This plateau occupies a much larger proportion of the surface in the north and east than in the west and south, and the greater portion of the island south of lat. 23° S. belongs to a much lower region which does not consist entirely of plains, but is interrupted toward the west by three prominent chains of hills stretching from north to south, one of them apparently in a continuous line about 600 miles in length. The coast exhibits a number of indentations, mostly small, but few good harbors, being in great part rock, though in some places low and sandy.

Hydrography.— The rivers are numerous; few of them offer the advantages of internal navigation. The chief rivers have their courses on the west and northwest side of the island. The Betsibóka with its affluent, the Ikiopa, unitedly measuring 300 miles, may be ascended by light steamers for 100 miles; the Tsiribihina has a somewhat shorter course, but drains by its numerous tributaries a much larger area. The eastern rivers descend from the high land through magnificent gorges, forming a succession of rapids and cascades, the falls in some instances having a descent of 500 feet. There are few lakes of any size as yet known to explorers; one of the largest is Alàotra Lake, measuring 25 miles long; the others do not reach a length of 10 miles. A long chain of lagoons having very short distances between each and often expanding into wide sheets of water stretches for nearly 300 miles along the coast.

Geology.— Geologically the elevated region consists almost entirely of granite and other igneous rocks, while the lower region is composed chiefly of secondary formations. The former region is traversed by a line of extinct volcanic craters, some of which show signs of comparatively recent activity. Among the more remarkable fossils are remains of a huge struthious bird, the Epiornis, whose egg, measuring 12 by 9 inches, is larger than that of any other known bird. The minerals include iron in abundance, gold, lead and copper, all more or less worked, while in the northwest coal is found.

Climate.— The climate is varied; the heat on the coast is often very intense, but on the high lands of the interior the temperature is moderate. On the coast the rains are nearly constant, beginning in the evening and sometimes lasting all night; in the interior the winter is dry and agreeable. The greatest amount of rainfall takes place on the east coast, and especially on the northeast, the part directly exposed to the summer monsoon. The elevated region of the interior and the districts on the west coast are tolerably healthy for Europeans, but owing to the large extent of marsh and lagoon on the east, malaria fever prevails, and is frequently fatal to natives from the interior as well as to Europeans. Snow is never found on even the loftiest mountains.

Ethnology.— The inhabitants, known by the name of Malagasy, belong to the Malayo-Polynesian stock and speak a Malayan language. They appear to form substantially a single race, though they have received a considerable intermixture of African blood and a certain amount of Arab intermixture. They are divided into numerous tribes, each having a distinctive name and customs. The Hovas are the predominant tribe; their proper country is the elevated region of the interior, but they extended their sway over nearly the whole island. Among the other chief tribes are the Betsimasaraka on the east coast, the Betsileo in the south central region and the Sakalava on the west and north. The people were socially divided into three classes: Adrians or nobles, Hovas (in a special and restricted use of the word) or free commoners, and Andevos or slaves: the nobles and slave classes have been abolished by the French. In the coast districts the houses of the better class are built of framed timber with lofty roofs covered with shingles or tiles; the dwellings of the lower classes are constructed of bamboo or rushes, or even of clay. In former and more unsettled times the villages were almost always built on the tops of hills, but during the 19th century this precaution has not been deemed so indispensable.

Flora.— The most striking feature in the

vegetation is a belt of dense forest with an average breadth of 15 to 20 miles passing round the whole island, and broken only by a gap in the northwest, where the two ends of the forest overlap. It is found at all levels from 6,000 feet to the water's edge, which it touches on the northeast, where it reaches its greatest breadth of 40 miles. The trees of this forest include many species of lofty palms, hard-wooded exogens supplying a great variety of beautifully veined and durable timber and a large number of trees remarkable for the splendid character of their blossoms. Of all the trees of Madagascar the most striking is the ravinala or traveler's tree (*Urania speciosa*); it resembles a palm, its stem being crowned by a semi-circle of oblong leaves spread out vertically in a fan shape. It owes its name to the fact that the traveler may supply himself with water from it by piercing or breaking the lower ends of the leaf-stalks.

Fauna.— Madagascar has a singularly local fauna which, although upon the whole related to Africa, is so peculiar to itself that, with a few neighboring islets, it forms a very distinct subprovince of the African region. Its characteristics show plainly that the separation of the island from the continent occurred at a very ancient time. Another singular feature is the presence of various forms of animal life represented elsewhere only in Oriental Australian regions, with a marked resemblance in a few animals, for example, the boas, to South America. From this it is plausibly argued that in early Tertiary times there was a land connection between Madagascar and India and the region thence to Australia, now presented only by the islands of the Malayan Archipelago. (See LEMURIA). In its mammals Madagascar is singular in what it lacks, as well as in what it possesses. It has none of the cattle, equine animals, elephants, rhinoceroses, hogs or even rodents of Africa, except a mouse or two; no lion or true cat or dog of any kind; and no monkeys. On the other hand it has several small insectivora, closely allied to tropical American species; the great majority of all the lemurs, the few outsiders being in Africa and the Orient; and several viverrine quadrupeds, which there takes the place of the predatory cats. The modern birds are less striking in their peculiarities, but in the zoological era immediately preceding the present the island possessed those huge ratite birds, the epiornis. and its relatives, which gave rise to the story of the roc. Many forms of huge land tortoises were also members of this singular fauna. The fishes, amphibians, reptiles and lower forms are largely peculiar.

Crocodiles are numerous in the rivers and lakes, and many species of lizards, chameleons and tree-frogs abound in the forests. Among the insects are numerous brilliantly colored beetles, butterflies, moths, flies, locusts and spiders, venomous species of the latter as well as scorpions and centipedes being present. See ZOOGEOGRAPHY.

Agriculture.— Of the vegetable products grown for food by far the most important is rice, the staple food of the inhabitants; next in importance came manioc or cassava, sweet-potatoes, beans, tomatoes, ground-nuts and yams. Ginger, pepper and indigo grow wild in the woods; cotton, sugarcane, coffee, tobacco and hemp are cultivated. Humped cattle are found in immense herds, and form a large part of the wealth of the inhabitants; they appear to have been introduced from Africa at a remote period, as the fat-tailed sheep, goats, swine and horses have been more recently. Under French administration agriculture and cattle-raising are undergoing considerable extension. A considerable part has been played in the settlement of the island by colonists from France. Cattle-breeding is especially important: there were 6,606,336 in 1916 on the island, exclusive of wild herds. In 1915 there were 2,290,046 acres under cultivation by natives, and 1,868,354 by Europeans.

Commerce and Industries.— Rice, cattle, hides, gum, india-rubber, wax, cotton, sugar, vanilla, lard, coffee, gold, gum-copal and dye-woods are exported. The chief imports are cotton goods, wines and spirits, metals, rice and flour. The imports in 1915 were valued at £1,750,694, the chief items for that year being cottons, £531,629; beverages, £134,807; and cloth £48,639. The exports for that year were valued at £2,642,644; the chief values being hides, £515,739; gold dust, £242,368; and rice, £148,196. In 1915, 4,050 vessels entered, totaling 1,706,293 tons, of which 2,971 were French (1,617,479 tons), and 666 (66,426 tons) British. In general the Malagasy show much aptitude for the manual arts. As silversmiths, gunsmiths and carpenters, they rapidly acquire the skill of Europeans; and with hand looms of the rudest construction, the only ones as yet in use, they make excellent and handsome cloths. The principal article of native dress with both sexes is the *lamba*, a piece of cloth about three yards long and two broad, which is folded round the body above the arms, one end being thrown over the shoulder.

The island is being rapidly opened up by the building of highways and carriage roads. A railroad has been completed between Tamatave, the chief port and capital, and Antananarivo the ancient capital (229 miles long) and branch lines are under construction. Automobile services have been established on the 1,000 miles of tolerable road.

Government.— Prior to 1895 the government was a native absolute monarchy. A French resident, however, with a military escort, resided at the court and controlled foreign relations, so that the country was virtually a French protectorate. Much friction prevailed in 1893–94, between the government and the French authorities, and finally France decided to make her protectorate of the island effective. An expedition easily overcome the resistance of the Hova troops, and after some changes in the formation of the administration the island was made a French colony, and General Gallieni was appointed first governor-general (1896–1905). His vigorous and determined policy made a great improvement in the condition of the country. The governor is assisted by an administrative council, and natives are largely employed in the civil and military administration. Forced labor was abolished in the public service in 1901. Education is free and compulsory, and instruction in French is obligatory. In the primary schools in 1916 there were 105,108 pupils. Instruction is also given in higher

schools in practical agriculture, industries and medicine. Numerous Catholic and Protestant missions and mission schools have long been established: in 1895 it was estimated that there were 450,000 Protestants and 50,000 Catholics in Madagascar. The army of occupation is composed of 2,411 French soldiers and 6,376 natives. The religion of the great bulk of the people is a kind of fetishism or worship of charms. A Court of Appeal and tribunals throughout the provinces provide for native justice, while there are special courts for the administration of French justice. The local revenue is derived chiefly from direct taxation, from customs and other indirect taxes, from colonial lands, posts and telegraphs, markets, etc., and from subventions granted by France. The local budget for 1916 balanced at £1,284,928, and there is a standing debt of £4,200,000.

Population.—According to the census of 1911 the population amounted to 3,153,511, of whom 2,690,381 were natives, 9,694 European, 1,000 Asiatic and African; 1916 estimate, 3,512,690 (14,390 French, and 2,710 foreigners). The Hovas, the chief native tribe, numbered 847,480; the Betsileo, 408,024, the Betsimasaraka, 288,159.

History.— Madagascar was known to the traveler Marco Polo at the end of the 13th century and had been visited for several centuries by the Arabs. In 1506 it was visited by the Portuguese, who gave it the name of Saint Lorenzo. Toward the end of the 17th and during the most of the 18th century the French endeavored to form military stations on the east coast, but with no lasting results. A settlement was established at Fort Dauphin in the southeast and held for some time, but in consequence of the tyrannical behavior of the French settlers they were massacred by the natives and the place destroyed. The French, however, struggled hard and successfully to retain the islands of Sainte Marie on the east coast and Nossibé on the northwest. Previous to 1810 Madagascar might be said to have been divided among numerous petty chiefs, almost constantly at war with each other. In that year, however, Radama I, a prince of remarkable intelligence, became king of the Hovas, and began to enforce a claim by right of conquest to the sovereignty of the whole island. He saw that if his people were to be prosperous they must first be educated and civilized. In return for the promise of co-operation in putting down the slave-trade on the coast of Mozambique, he received arms and other assistance from the British, by which he was enabled to carry on his conquests. Christian missionaries began to teach in the capital in 1820, many converts were made, the Bible was translated into the Malagasy tongue, the language was first reduced to a systematic written form and printing was introduced. Great improvements had taken place in the manners of the people when Radama died in 1828, and was succeeded by his chief wife, Ranavalona, a woman of cruel disposition, and opposed to all innovation. The native converts were persecuted, many of them being put to death, and the island was closed to Europeans. This reign of terror ended at last in 1861, when the queen died, and was suceeded by her son, Radama II, who, himself a Christian, reopened the island to European missionaries and traders, and proclaimed the emancipation of the African slaves. He appears, however, to have been a weak prince easily swayed by native and foreign favorites, and he unwisely granted extensive territories and privileges to an enterprising French company, an act which lost him the affection of his nobles, and led to his assassination in 1863. His wife Rasoherina was placed on the throne, and the government repudiated the concessions made to the French, offering 1,000,000 francs as compensation. After a quiet and prosperous reign of five years this queen died, and was succeeeded by Ranavalona II in 1868. After she had been elected queen she and a great number of her courtiers became Christians, and many reforms favorable to enlightenment and humanity were perseveringly carried out. She was succeeded in 1882 by Ranavalona III, when the French brought forward their claims on the Malagasy territory, which, being refused, led to hostilities in 1883–85. This war was terminated by a treaty, under which France acquired protectorate rights over Madagascar; but hostile feeling toward the French again led to war in 1895, with the result that the queen was deposed and exiled first to the island of Réunion, and thence in 1899 to Algiers, while Madagascar became a French colony.

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MADAME BOVARY. 'Madame Bovary,' the first and best-known novel of Flaubert, a type and model for the fiction of the next generation, was the first and is probably still the best of minute reproductions of the platitudes of modern life. It was published in 1856 when Flaubert was already 35, the fully matured and laboriously executed expression of his effort to make writing a means of emancipation from self. The French literary historian Lanson thinks it may well prove "the masterpiece of contemporary fiction." Flaubert's own education had been out of key with his provincial surroundings, and he chose natures similarly out of tune with their environment for the first object of his study, with a painstaking accumulation of "significant little facts" quite in the spirit of Taine's psychology and literary criticism. Flaubert had worked on 'Madame Bovary' at least since 1852, "eighteen hours out of the twenty-four," he tells George Sand, and adds, "I seek something better than success, I seek to please myself." The novel attracted immediate and wide attention, presently stimu-

lated by a prosecution of the author for alleged immorality, a celebrated case, ending in a curiously qualified acquittal. The court pleadings and judgment, printed at Flaubert's insistence with subsequent French editions of the novel, throw strange light on the moral ideas of the last decade of the Second Empire.

'Madame Bovary' marks the transition from the fiction of romantic fancy to that of close realistic observation, preferably of the petty, the puerile and the commonplace. The theme is the banality of provincial life, as Flaubert saw and felt it; the lesson is the futility and danger of a sentimental revolt from the commonplace when vulgar souls indulge in romantic aspirations. Briefly the story is this: Charles Bovary, a "medical man," though not an M.D., fatuously good, timidly banal, is shown us first as a dull pupil, then unsympathetically married, then a widower attracted to a farmer's daughter, Emma, the book's chief subject, whom he marries, apparently the less initiated of the two. Emma's convent education beyond her station had been supplemented by romantic poetry and fiction, in Flaubert's opinion a deliberate perversion, whose degrading and immoral results he proposes to show. Charles was happy; Emma ever restlessly reaching out toward a fulfilment of her romantic aspirations. Chance brought her to an aristocratic ball. Dormant emotions were awakened. "She desired at the same moment to die and to live in Paris." Léon, a law student, served her for a platonic attachment, presently to be succeeded by Rodolphe, after Emma had sought sentimental consolation in religion, quite in vain. Rodolphe's carnally-minded courtship, a bitterly ironically parody of romanticism, is successful; but from dreams of bliss Emma is relentlessly drawn down to and below the commonplace. Both weary, Emma again seeks refuge in religion, but meeting the now more sophisticated Léon yields once more, and plunges Charles into debt while still seeming to him more charming than ever, as she descends the last steps of dissimulated corruption. Abandoned by Léon, once more rejected by Rodolphe, she escapes life by poison, holding even beyond death the infatuated love of Charles, who, even though at last undeceived, dies with a lock of her hair in his hand.

Incidental to the story are some admirable character studies of provincial types, notably M. Homais, druggist-demagogue and materialist, incarnation for Flaubert of "triumphant democracy," a by-word for the narrow, provincial philistine, who has given his name to a social species. His counterfoil is the parish priest, Bourrisien, whose cure of souls is a perfunctory, well-meaning, uncomprehending fatuity. More subordinate but strongly individual are the sacristan Lestiboudois, the notary Guillaumin, and the merchant-money-lender Lhereux.

Apart from its subtle psychology 'Madame Bovary' won and holds admiration for its phrases of flashing irony, its vivid narration and fine descriptive passages, but no less for its linguistic euphony, a matter to which Flaubert gave untiring and at times almost morbid attention. Ethically it reflects its author's sombre pessimism. To Flaubert all spiritual aspiration seems foredoomed to failure. For himself he sought forgetfulness in the pursuit of art for art's sake. In this book he presents neither a character to imitate nor an act to admire. Yet 'Madame Bovary' is, in Bourget's phrase, "the very ideal of the literary artist." There are translations by W. Walton and others. Consult Whitehouse, H. R., 'The Life of Lamartine' (2 vols., New York 1919).

BENJAMIN W. WELLS,
Author of 'Modern French Literature.'

MADDEN, Frederic William, English numismatist: b. London, 9 April 1839; d. Brighton, 20 June 1904. He is a son of Sir Frederic Madden, a noted antiquary, and was chief librarian of the Brighton Public Library, 1888–1902. He published 'Handbook of Roman Numismatics' (1861); 'History of Jewish Coinage' (1864), republished in enlarged form as 'The Coins of the Jews' (1881), and (jointly with S. W. Stevenson) 'Dictionary of Roman Coins' (1889).

MADDER, (1) *in botany,* the English name of the plants of the genus *Rubia,* especially *R. tinctorum.* It is a trailing or climbing annual, supporting itself by its leaves and prickles. It is supplied chiefly from Holland, France, Italy and Turkey. The roots are kiln-dried and then threshed; they are then dried a second time, and afterward pounded and stamped in a mill. Indian madder, called also madder of Bengal, is *R. cordifolia.* (2) *In chemistry,* the root of *R. tinctorum* is extensively used in dyeing for the production of a variety of colors, namely, red, pink, purple, black and chocolate. Other species of *Rubia* are also used. It would appear that madder contains a colorific principle — ruhian — which, under the influence of a peculiar ferment, termed erythrozym, breaks up into alizarin, purpurin, etc. The colors produced from madder are very stable, the well-known Turkey-red being one of them. Madder also contains certain yellow coloring matters, but they are useless, if not injurious, in the process of dyeing. (See DYES; DYEING). (3) *In pharmacy,* madder is a tonic, diuretic and an emmenagogue. Brown madder, a rich red-brown pigment, prepared from the roots of *R. tinctorum.*

MADDOX, Richard Leach, English physician and chemist: b. Bath, England, 4 Aug. 1816: d. Portswood, Southampton, 11 May 1902. He studied medicine at University College, London, but was graduated M.D. at Edinburgh. In early life he settled and practised his profession in Constantinople, and here first took up the study of photography. He subsequently left the Bosphorus for Smyrna and was a civil surgeon in the military hospitals at Scutari during the Crimean War, and finally settled at Woolston, near Southampton, England. It was during his residence at Woolston, which lasted until 1874, that he worked out the process which has revolutionized the art of photography, by substituting the gelatino-bromide for the collodion plate. With him originated the gelatino-bromide dry plates to take the place of the wet collodion plates which, besides other inconveniences, sometimes produce an atmosphere which is dangerous to the operator's health. There have been more than one claimant to the credit of this discovery, but it has been decided by the *Scientific American* that Dr. Maddox is entitled to all the honor of the invention.

MADEIRA, mą-dē'rą (Port. mä-dā'ē-rä), a group of Atlantic islands belonging to Portugal, opposite to and about 360 miles distant from Morocco, on the west coast of Africa and about 535 miles southwest of Lisbon. Madeira, the principal island, and the islets of Porto Santo, Dezerta Grande and Bugio, comprise the group with an area of 314 square miles, and a population of about 169,783. The main island (area, 300 square miles) consists of a collection of mountains of volcanic origin, the most elevated of which is upward of 6,000 feet high. Through the west half of the island runs a central ridge about 5,000 feet high, on which is an extensive plain called Paul de Serra. The east portion of the island, though elevated, is less so than the west. From the central mass steep ridges extend to the coast, where they form perpendicular precipices of from 1,000 to 2,000 feet high. These cliffs are indented by a few small bays, where a richly cultivated valley approaches the water between abrupt precipices or surrounded by an amphitheatre of rugged hills. These narrow bays are the sites of the villages of Madeira. The most striking peculiarity in the mountain scenery of the island is the jagged outline of the ridges and the deep precipitous gorges which cut through the highest mountains almost to their very base. The road round the island is in many places exceedingly picturesque, being led often between lofty cliffs or along the front of precipices overhanging the sea. The Madieras were known to the Romans under the name of *Purpurariæ Insulæ*. They were rediscovered by the Portuguese in 1420, and the name Madeira was given to the principal island from the magnificent forests of building timber (in Portuguese *madeira*) which then covered it. It was settled by the Portuguese in 1431. From 1580 to 1640 the islands, with Portugal itself, were under Spanish rule, and have twice (1801, 1807–14) been under the British flag. Funchal, the capital (pop. 24,687), is an episcopal see. The inhabitants are devout Roman Catholics. The mean annual temperature of Madeira is 65° and the climate, from its constant and temperate warmth, is well known for its favorable effects on those suffering from pulmonary and other complaints, which renders the island a favorite resort of invalids from Great Britain and elsewhere. Large and well-appointed hotels exist at Funchal. The islands are connected with Great Britain, France and Belgium, and with the United States, by steamship lines. The staple product of Madeira is wine, the quantity of which in good years prior to the appearance of the vine disease in 1852 amounted to 2,750,000 gallons. The annual export is now about 700,000 gallons. Sugar-cane, and the cactus for the rearing of cochineal, are cultivated, fruit and vegetables are grown, fisheries are actively engaged in, linen, woolens, leather, straw hats, baskets, soap, sugar, spirits, butter, etc., are manufactured. The chief import is coal, the most important of the others being wheat, rice, Indian corn and dry goods.

MADEIRA, or **CAYARI,** Brazil, a large navigable affluent of the Amazon, about 800 miles long, formed by the united streams Beni and Mamore on the frontiers of Brazil and Bolivia. The length from the source of the Mamore is 2,000 miles.

MADELEINE, Marie Angélique, DE SAINTE, French abbess, prioress of the convent of Port Royal, Paris. See under baptismal name, ARNAULD, JACQUELINE MARIE.

MADELEINE, mąd'lān', **La,** France, a prehistoric station in the valley of the Vézère, midway between Moustier and Les Eyziès. The Madelenian, or Magdalenian, Epoch was named from this cave by the French anthropologist, Gabriel de Mortillet.

MADELEINE, mäd-lān, **La,** a church in Paris, in a square of the same name, commenced in 1764. It was remodeled and changed after the Revolution, and in 1832 was completed at a cost of $3,000,000. The church is built in the form of a Roman temple and is 100 feet high, 354 feet long and 141 feet wide. The bronze doors by Triqueti are 35 feet high and 16 feet in width. The building, which has no windows, is lighted from above.

MADEMOISELLE DE MAUPIN, mō'-păn'. 'Mademoiselle de Maupin,' a novel written by Théophile Gautier when he was only 24 years of age (1835), expresses the most salient features of romanticism. In the somewhat long preface is found the key to the interpretation of this highly imaginative work. Gautier cries out against the shammed respectability of that period and condemns the prudish stand of literary critics who according to him are merely hypocrites actuated by envy. Violently opposed to classical traditions and ideas, Gautier, who had been trained as a painter, keeps in this work the painter's vision, and emphasizes primarily form and color, while defending art for art's sake. Digressions on the supreme value of beauty are found frequently throughout the pages, and the vivid imagination of the author is fruitful to the point of exaggeration. The heroine, brought up according to tradition, rebels against it, and, disguised as a man, like the Amazons of old, resolves to study life at first hand. After many unusual adventures she becomes for one day the long-sought ideal of a romantic poet who had searched in vain until then for the "woman" of his dreams and who found her only to lose her immediately. As a novel the work is crude both in subject matter and in development, showing that it comes from a young man whose passions were not yet calm. It is, however, essentially artistic; the style is full of color and abounds in beautiful descriptions and lyric passages. While the novel did succeed in amazing placid citizens and is still classed as dangerous reading, it must not be considered as a study of any type of French character, but as a flight of imagination, a descriptive fantasy artistically worked out by a talented writer of the Romantic school.

LOUIS A. LOISEAUX.

MADEMOISELLE DE LA SEIGLIÈRE, sā'glyār, novel by Jules Sandeau (q.v.), published in 1848 and dramatized in 1851.

MADERO, mą-dā'rō, **Francisco Indalecio,** President of Mexico: b. San Pedro, Coahuila, 18 Oct. 1873: d. Mexico City, 23 Feb. 1913. He came of a wealthy family and was a grandson of a former governor of Coahuila. He was educated at a Jesuit college in Mexico and at the University of California and spent the years

1889–95 in France. He returned to Mexico, engaged in cotton-planting and in banking and materially increased his fortune. He took up his residence in Mexico City in 1900 and became keenly interested in political reform. Of a naturally retiring disposition, he displayed an initiative that surprised his most intimate friends, and by 1905 he was the unquestioned leader of the reform element. He actively opposed the rule of Díaz, and in 1908 he published his 'La Sucesión Presidencial en 1910,' a strikingly well-balanced attack on the evils existing in the political and social life of Mexico. He advocated suffrage reforms, a single term for the Presidency and opposed the absolutism which characterized the rule of Díaz, while crediting him with the many achievements of his administration. The book caused a sensation and was promptly suppressed by the government. However, Madero was nominated for the Presidency in 1910, running against Díaz on a platform advocating a single term for the Presidency. He was arrested on a fabricated charge in July 1910 and imprisoned until it was too late for him to interfere with the re-election of Díaz. Madero then headed a plot for a revolution against the government, advocating reforms in suffrage, land distribution, freedom of the press and the single presidential term among other measures. The uprising began at Puebla, 20 Nov. 1910, spread through Sonora and Sinaloa, and upon capturing Juarez, Madero set up his government and appointed a cabinet, 11 May 1911. The Díaz government then entered into a conference with the revolutionists and peace was declared 21 May. Madero was elected President 1 October. Temperamentally a dreamer and idealist, Madero found himself checked upon every hand in his attempts to carry his projected reforms into effect. He was unable to manage the politicians of the old régime, or the insurgent element, and in 1912 revolts broke out under Zapata in the south and under Félix Díaz, nephew of ex-President Díaz, in the north. He was charged with being slow and irresolute in his administration of public affairs, of favoring his relatives and of personal peculation from the public treasury. The Díaz revolution was suppressed and General Díaz was imprisoned. Madero, however, was of a forbearing disposition and suspended the death sentence pronounced against the revolutionist. An uprising among the soldiers in Mexico City took place 9 Feb. 1913 and released Díaz and another enemy of Madera, General Bernardo Reyes. The Federal troops for a time resisted the revolutionists but on 17 February General Blanquet with a force of 1,200 arrived in the city and joined General Huerta, Maderos commander-in-chief, in overthrowing the government. Madero was arrested and imprisoned 19 February and plans for his exile were under way when it was decided to bring him to trial. Together with the Vice-President, Pino Suarez, Madero was being conducted from the National Palace to the penitentiary when both were shot. No reports except those of the government were available and the official version was that an intervention in behalf of the prisoners was made by Madero sympathizers, whereupon the prisoners attempted to escape and were shot. Huerta was generally held responsible for their deaths and was eventually forced from office because of them although he persistently denied complicity in the affair.

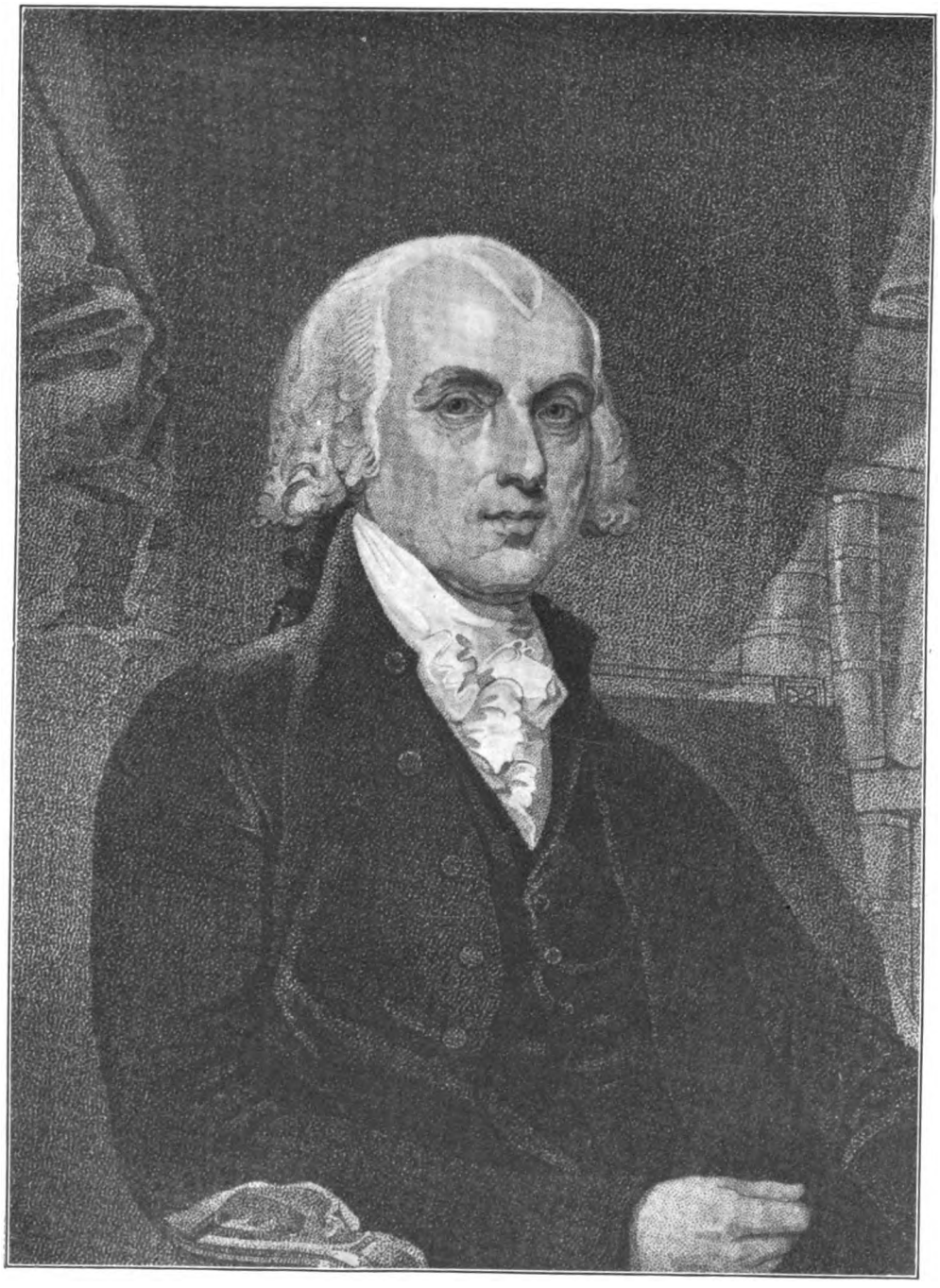
MADHAVA, mä'dha-va, another name of the Hindu god Vishnu (q.v).

MADIA OIL, oil expressed without heat from the seeds of *Madia sativa.* It is transparent, yellow, odorless and may be used on the table as a substitute for olive oil or for oil-cake for cattle. The plant is a composite, native to southern South America, but has long been cultivated in Europe for its oil-bearing seeds.

MADISON, James, American Protestant Episcopal bishop: b. Rockingham County, Va., 27 Aug. 1749; d. 6 March 1812. He was graduated at William and Mary College in 1772, studied law and was admitted to the bar, but soon after abandoned law for divinity. In 1773 he was chosen professor of mathematics in William and Mary College, and in 1775 went to England and was admitted to orders by the bishop of London. In 1777 he was elected president of the college, and during the American Revolution succeeded in keeping the college in active operation. Having been chosen as bishop of Virginia he was consecrated by the archbishop of Canterbury, in Lambeth Palace, 19 Sept. 1790. He continued to discharge the duties of president of the college and professor of natural and moral philosophy, international law, etc., with those of the episcopate, until his death. His only publications were several occasional discourses and a 'Eulogy on Washington' (1800).

MADISON, James, fourth President of the United States: b. Port Conway, Va., 1751; d. Montpelier, Va., 28 June 1836. Madison was the eldest son of James Madison, a Virginia planter, and of Nelly Conway, daughter of Francis Conway, of King George County, Va. His father, a man of independent means, lived on an estate now known as Montpelier in Orange County. James was born at Francis Conway's home on the Rappahannock while his mother was on a visit to her parents. His educational advantages were excellent for the times; he attended the school of a Scotchman, Donald Robertson, was well prepared for college by the clergyman of the parish, the Rev. Thomas Martin, and entered Princeton in 1769. His application to his studies was excessive, and was in part the cause of later ill health; he succeeded, however, in taking the studies of the last two years in one year and took his B.A. degree in 1771. He remained at Princeton for another year doing special work in Hebrew under Dr. Witherspoon, the president. After his return home he tutored his younger brothers and began a systematic course of reading in theology, philosophy and law. At this time his study of Hebrew and theology seem to indicate a desire to enter the ministry, but he soon abandoned this and prepared himself for the legal profession and for public service. His theological studies bore good fruit later as is evidenced by the stand he took for religious liberty.

Madison was by instinct a politician and not a soldier; he took no active part in the Revolutionary War, but as early as 1774 he was appointed a member of the Committee of Public Safety for Orange County, and in 1776 was elected delegate to the convention which framed the constitution of Virginia. From that time



JAMES MADISON

Fourth President of the United States

until he retired from the Presidency he was honored with high public offices by his State and by the nation. In the Virginia Convention Madison succeeded in substituting for a clause in the Bill of Rights permitting the "fullest toleration" in religion, a clause allowing the "free exercise of religion." This was a distinct blow to religious intolerance for, as he said, toleration implies jurisdiction, and the State should have no coercive power over religious thought. He was a member of the first Virginia assembly but failed of re-election because, as his biographer Rives tells us, he refused to conform to the universal custom of his day and "treat" his constituents; he was, however, made a member of the governor's council and so distinguished himself that in 1780 while still under 30 he was chosen at delegate to the Continental Congress. In this Congress he was conspicuous for his opposition to the issuance of paper money by the States; for his efforts to secure for Congress the right of taxing imports, and for his determined stand to retain for the States the right of navigation on the Mississippi. Madison saw clearly that a government so organically weak that it could not enforce its requisitions and could pay its debts only by increasing its debt could never be effective; hence he labored unceasingly to enlarge the power of the central government. The office of delegate was limited to one term, so Madison was not returned to Congress in 1784, but the high esteem in which he was held was shown by his immediate election to the State assembly. Virginia was a very influential State and her attitude toward national questions was of great importance. In the assembly Madison tried to indoctrinate the people of Virginia with his ideas concerning the Federal power. His bill to regulate trade in Virginia and to provide ports of entry led first to the conference between Virginia and Maryland with reference to trade on the Potomac and later to the Annapolis Convention which met in 1786 to consider the trade and commerce of the United States. This Convention at Annapolis urged upon the States the appointment of commissioners to meet in convention at Philadelphia "to devise such further government as shall appear to them necessary to render the Constitution of the Federal Government adequate to the exigencies of the Union." The summoning of the Philadelphia Convention was largely due to the wise bills introduced by Madison in the Virginia assembly and to his direction of public sentiment, and it was eminently fitting that he should be one of the delegates of the Virginia Commission at whose head was George Washington. Madison's views on government are clearly defined in his "outline system" which formed the basis of the Virginia plan proposed to the Convention. His system demanded that there should be a due supremacy of national authority without the exclusion of local authority, that the national authority should extend to the judiciary and to the militia; that the national legislature should be composed of two bodies, the larger elected for a short, the smaller for a longer term; that Congress should have certain coercive powers; that a national executive should be provided and that the basis of representation in Congress should be changed from States to population. The "Virginia plan" was the germ of the Constitution and Madison is rightly called the "Father of the Constitution." His arguments in favor of the proposed government were exhaustive and convincing, and his private notes of the work of the Convention and of his debates purchased from his widow and published by Congress form a valuable addition to our knowledge of this stormy period. While the Constitution was before the people for consideration Madison, Hamilton and Jay wrote a series of papers called in collected form *The Federalist*, in which they discussed government in general, defined the character of the proposed union, met objections and proved the advantages to be derived from effective central government. Madison was a member of the Virginia Convention which met to consider the ratification of the Constitution and by his keen analysis and clear-cut argument contributed more than any other man to secure its adoption. His chief opponent was Patrick Henry; his ablest ally, John Marshall. Owing to Henry's antagonism, Madison was defeated as candidate for the Senate, but was elected as representative to Congress and took his seat in April 1789. During this session of Congress, Hamilton and Madison, who had hitherto been as one in their efforts to centralize power, drifted apart, and Madison gradually began to endorse Jefferson's position as to certain inalienable States' rights. There is no reason to accuse him of bad faith; his statesmanship was never overbold, and Hamilton's commercial system, his extensive financial schemes, especially the funding of the national debt and the assumption of State debts by the general government, gave so much power to Congress that Madison withdrew his support from the Secretary of the Treasury and vigorously opposed his measures. Although Madison had now definitely cast in his fortunes with the Republican opposition his moderation and good sense enabled him to retain the friendship of most of his political opponents.

From 1793 to 1796 the country was greatly agitated over the relation of the United States toward France, and on the outbreak of war between France and England the President issued a neutrality proclamation to the great disgust of the French, who had expected active friendship from the United States. Although both countries interfered shamefully with American commerce, popular sentiment and the Republican party sided with France. In 1794 Madison, supported by Jefferson, introduced a bill demanding retaliatory measures against Great Britain, and a temporary embargo was laid on British commerce. The signing of the Jay treaty by the President was a signal for an outburst of popular indignation, and Madison, as leader of the opposition in Congress, opposed the appropriation of money to carry out the terms of the treaty. In 1797 Madison retired and enjoyed for a short while the pleasures of private life. A year later he was aroused to activity by the passage of the unpopular Alien and Sedition Acts. The Virginia resolutions written by Madison denounced these laws and declared that in case of a dangerous exercise by the Federal government of powers not granted by the compact the States had the right to interfere. These resolutions still further emphasized the position of the Republican party and pledged it to the support of States' rights. The year 1801 brought an overwhelming defeat to the Federalists; Jefferson was inaugurated President and

Madison became Secretary of State. He was thoroughly in sympathy with the President's views and shared the popularity of that brilliant administration. The last years of Jefferson's second term were clouded by the insulting actions of England and France with reference to the American navy. The orders of the British and the decrees of Napoleon concerning the seizure of neutral vessels were ruining American commerce. Vessels were seized by the English and by the French, American seamen were impressed and ports blockaded. Jefferson was opposed to war in his efforts to coerce France and England by commercial restrictions he induced Congress to lay an embargo on British trade. Instead of injuring England this seriously crippled American commerce and was soon repealed. In this troubled condition of affairs Madison became President in 1809. Like Jefferson he was opposed to war and tried diplomacy. He attempted through Erskine, the British envoy, to have the British Orders in Council withdrawn. Erskine agreed, but the British government repudiated the action of its envoy. Negotiations with another British Minister, James Jackson, were also fruitless. Continued insults were heaped upon American ships and men; the country demanded definite action against the aggressors; even the peace-loving President, weary of the offensive attitude of England, at last gave his consent to war. On the 18th of June 1812 war was declared and continued with varying success until the Peace of Ghent in 1814. After nearly three years of fighting, after ruinous loss of money and property, the country was practically just where it stood in 1812, "its boundary unchanged, its international rights still undefined, the people still divided." Madison lacked vigor as a war President, nor had he sufficient determination to secure advantageous terms of peace. He was far greater as a framer of the Constitution than as an executive.

In 1817 Madison retired from office and settled on his estates of Montpelier. He had married in 1796 Mrs. Todd, afterward the celebrated Dolly Madison, and with her he enjoyed 20 peaceful years in his country home. He was interested in farming, he thought and wrote much on all topics of public interest. He discussed social and moral questions, slavery and education. "Education," he maintained, "was the true foundation of civil liberty." The last public appearance of the venerable statesman was in the Virginia Convention of 1829 which met to amend the State constitution. In character Madison was thoughtful, reserved and cautious; in a time of hard drinkers he was notably abstemious. Moderation characterized all his habits. Dignified and kindly and an excellent conversationalist among those he knew well, he made and retained warm friends. His knowledge was profound and accurate, and he was considered an authority on all constitutional matters. His literary style was labored, but his arguments were keen, comprehensive and convincing.

Consult Lives of Madison by J. Q. Adams (1850); Rives (1859–68); Gay (1884); also 'Letters and Writings of Madison' edited by Hunt (9 vols., New York 1900–10); Adams, Henry, 'History of the United States from 1801 to 1817' (1889–90). Consult also Hunt G., 'Life of James Madison' (New York 1902); Taylor, H., 'The Real Authorship of the Constitution of the United States Explained' (Washington 1912); Wilson, J. G., 'Presidents of the United States' (Vol. I, New York 1914).

EMILIE MCVEA,
Of the University of Tennessee.

MADISON, Lucy Foster, American novelist: b. Kirksville, Mo., 8 April 1865. She was educated at the high school in Louisiana, Mo., and was married in 1890 to W. S. Madison. She has published 'A Maid of the First Century' (1899); 'A Maid at King Alfred's Court' (1900); 'A Colonial Maid' (1902); 'A Daughter of the Union' (1903); 'A Maid of Salem Towne' (1906); 'Peggy Owen' (1908); 'Peggy Owen at Yorktown' (1911); 'Time's Follower' (1914); 'A Life of Joan of Arc' (1918).

MADISON, Ga., city, county-seat of Morgan County, on the Central of Georgia and the Georgia railroads, about 70 miles east by south of Atlanta. It is situated in an agricultural region largely devoted to the cultivation of cotton. Its manufactures are cottonseed oil, furniture, chairs, baled cotton and dairy products. Madison has a large cotton trade. Pop. 2,412.

MADISON, Ill., village in Madison County, on the Mississippi River, at the end of Merchant's Bridge from Saint Louis, and at a junction of 11 railroad lines, among them the Illinois Central. It has car-shops, steel-mills and other manufacturing industries and a growing population. Pop. 5,046.

MADISON, Ind., city, county-seat of Jefferson County, on the Ohio River, and on the Pittsburgh, Cincinnati, Cleveland and Saint Louis Railroad, about 85 miles southeast of Indianapolis. Steamers ply regularly connecting Madison with river ports on the Ohio and Mississippi rivers. The city was founded in 1808 and was incorporated in 1824. Its principal industrial establishments are foundries and machine-shops, lumber yards, cotton and woolen mills, flour and lumber mills and furniture and tack factories. Madison is now a large loose-leaf tobacco market. Madison is the trade centre for quite an extent of territory in Indiana and Kentucky. Its educational institutions are public and parish schools. Hanover College is located in its environs. Because of the historic importance and the beauty of its hills and villages Madison has many visitors. A steam ferry across the Ohio is located here. The waterworks plant is owned and operated by the city. Pop. 6,934.

MADISON, Me., village in Somerset County, on the Kennebec River, 27 miles northwest of Waterville, and on the Maine Central Railroad. The first settlers came here about 1730 and the village was incorporated in 1804. There is abundant water power, an electric-light plant, and manufactures include lumber, woolens, paper, paper-pulp and sash and blinds. Pop. 2,408.

MADISON, N. J., borough, in Morris County, on the Delaware, Lackawanna and Western Railroad, about 25 miles west of New York. It is a residential borough where a number of New York and Newark business men have their homes. It is one of the oldest places in the State, having been settled before the

Revolution, but was not incorporated until 1889. The principal industry is floriculture, especially the cultivation of roses. Madison is the seat of the Drew Theological Seminary; and Convent Station nearby is the seat of Saint Elizabeth's College. The borough has an excellent public library and a splendid public park, well laid out and kept in good order. It is governed by a mayor and council. The term of office of the mayor is two years. The electric-light plant and the waterworks are owned and operated by the borough. Pop. 4,658.

MADISON, S. Dak., city, county-seat of Lake County, on the Chicago, Milwaukee and Saint Paul Railroad, about 400 miles northwest of Sioux Falls. The surrounding region has good farming land, wheat and corn being the principal crops. Considerable attention is given to stock raising. Madison is an important division point on the Milwaukee system, and has flouring mill and large poultry and egg houses. The trade is chiefly in grain and livestock, but there are also a gasoline engine factory, a large creamery and marble works. Madison is the seat of a State Normal College and also has a Carnegie library. It also has an excellent system of public schools fashioned largely after the Gary plan yet not so exclusively material in all respects. The electric-light plant and the waterworks are owned and operated by the city. The city is under the commission form of government. Pop. 4,300.

MADISON, Wis., city, capital of the State, county-seat of Dane County, on the Chicago, Milwaukee and Saint Paul, the Illinois Central and the Chicago and North Western railroads, about 80 miles west of Milwaukee and 139 miles northwest of Chicago. It is between Lakes Monona and Mendota and near two other beautiful lakes, Kegonsa and Waubesa; it is 974 feet above the sea and 210 feet above Lake Michigan. The place was named in honor of James Madison. The first house was erected in 1837; and after Wisconsin, in 1836, had been organized as a Territory, this site was chosen for the capital, and work on the Capitol was begun in 1837. The place was chartered as a city in 1856. Madison is situated in an agricultural region and has commercial interests with a number of the larger cities, also with the small towns and villages in Dane and adjoining counties. Its chief manufactures are boots and shoes, agricultural implements and tools, flour, electrical machinery, wagons and carriages, blank books and law books, hospital furniture and fixtures, horse collar pads, dry batteries, cement stave silos, rennet extract, art glass, relief maps and models, boats, candy, cigars, beverages, lantern slides. It is a famous summer resort because of its climate, lakes and scenery. The drives are remarkable — about 30 miles of road in the vicinity are macadamized, kept in repair and beautified by popular subscription. Madison is noted for its educational institutions, chief of which is the University of Wisconsin. Opposite the university is the State Historical Society headquarters, the most beautiful building in the city next to the Capitol. It is Renaissance-Ionic, of Bedford limestone, and the original cost was $1,000,000. It contains a valuable collection of historical mementos and the famous reference library of the society, about 245,000 volumes. It is considered one of the best historical libraries in the United States. The libraries of the Wisconsin Academy of Sciences, Arts and Letters and of the State University are also in this building. The city free public library is housed in a building of its own, a gift from Andrew Carnegie. Just outside the city limits are the Sacred Heart Academy (a boardng school for girls), a branch of the Battle Creek Sanitarium, the State Fish Hatchery and the State Hospital for the Insane. The public and parish schools maintain a high standard. Some of the other prominent buildings are the new State Capitol, just being completed at a cost of between $6,000,000 and $7,000,000, which is surrounded by a beautiful 14-acre park, a building of Bethel granite, in the Italian-Renaissance style, with the second highest dome in the United States; the county courthouse and jail, a government building, soon to be replaced by a new one, for which Congress has appropriated $550,000; and some 24 churches. It is a favorite educational convention city. The university summer school, held each year, attracts a number of students. The government is vested in a mayor, whose term is two years, and a council. The city owns and operates the waterworks. Pop. about 30,000.

MADISON BARRACKS, N. Y., United States military post in Jefferson County, on Black River Bay, near Sackett's Harbor, and 10 miles from Lake Ontario. The post occupies about 108 acres and possesses in addition a rifle range of 868 acres at Stony Point. It was established in 1813.

MADISON RIVER, a stream in Montana which has its rise in the Rocky Mountains, at an elevation of 8,300 feet. It flows north through Madison County and unites with the Jefferson Fork of the Missouri, at Three Forks. It flows through several picturesque valleys and deep cañons; its whole course is about 230 miles.

MADISON SQUARE GARDEN, a large building in New York City, occupying a block or square between Madison avenue and 4th avenue, and 25th and 26th streets. It contains an amphitheatre seating 20,000 people, and is popular for horse shows, dog shows, circuses and political and religious meetings. The building also contains a theatre, concert hall, restaurant and roof-garden. It is built of buff brick and terra-cotta and is surmounted by a great tower 300 feet in height, modeled after the Giralda at Seville. It is one of the largest buildings in the city devoted to amusement.

MADISONVILLE, Ky., city, county-seat of Hopkins County, on the Louisville and Nashville and the Kentucky Midland railroads, about 125 miles southwest of Louisville. It is in a rich agricultural region, tobacco being one of the principal productions. Coal and natural gas are in the near vicinity. The chief manufacturing establishments are a tobacco factory, tobacco stemmeries, lumber and planing mills and flour mills. A coal mine nearby and the natural gas contribute to the prosperity of the city. The city owns the electric-light plant, the waterworks and the sewage system. Pop. 4,966.

MADISONVILLE, Ohio, former village in Hamilton County, now absorbed by Cincinnati, and forming a residential suburb of that city.

MADLER, mä'dlėr, **Johann Heinrich,** German astronomer: b. Berlin, 29 May 1794; d. Hanover, 14 March 1874. He was educated at the University of Berlin. He became a professor and one of the governing faculty at the Berlin Normal School and was associated with William Beer in an extended series of lunar observations. He was professor at the Observatory of Berlin in 1836–40, and from 1840–65 he was professor and director of the observatory at Dorpat, Russia. The superb equipment of the observatory enabled him to make observations with an accuracy never before attained and he now devoted himself principally to the fixed stars. He published a map of the moon in four sheets which surpassed anything then published, and which still retains a high reputation, in 1834–36. Author of 'Populäre Astronomie' (1841); 'Die Centralsonne' (1846); 'Die Eigenbewegungen der Fixsterne' (1856); 'Allgemeine Selenographie' (1857); 'Geschichte der Himmelskunde' (2 vols., 1872–73), etc.

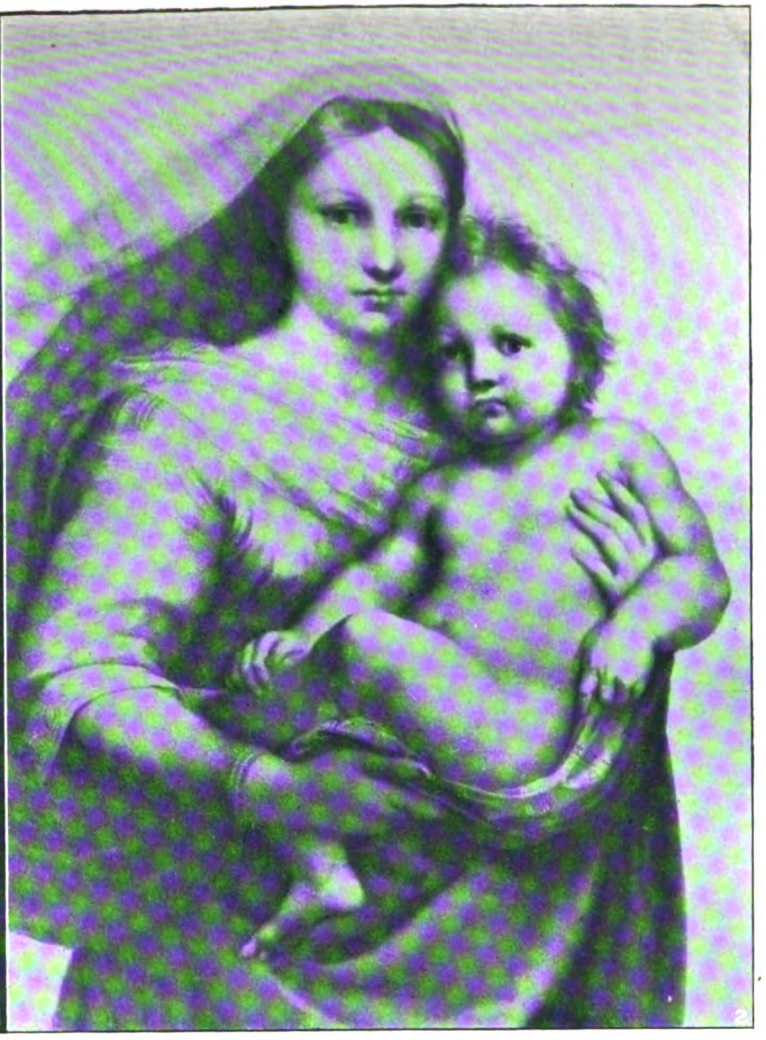
MADNESS. See INSANITY.

MADOC, mäd'ok, Welsh prince, who, in consequence of some civil dissensions, went to sea with 10 ships, and 300 men, in 1170, and discovered America. He made a second voyage to and from this unknown land, but finally was lost to the knowledge of his countrymen. The story is to be found in Lloyd and Powell's 'Cambria' (1584), and Hakluyt gives an account of the voyages in his collection. In Owen's 'British Remains' the legend is referred to. Later travelers have imagined that they had discovered traces of these early immigrants in different parts of the country, and we have had stories of white Indians and Welsh Indians, etc. (Consult Humboldt's 'Personal Narrative,' Book IX, note A). Southey made Madoc the subject of an epic poem. Stephens, in 'Madoc, an Essay on the Discovery of America in the 12th Century' (1893), asserts that the story of Madoc is a baseless fable.

MADONNA IN ART, The. In the early days of Christianity the teaching of the Church was largely carried on by the medium of pictures; statuary was added later. The translation of the Bible was in Latin and examples of the book were produced in parchment manuscripts emanating from the monastery *scriptoria.* They were very few and therefore costly. Hence it is not surprising that the clergy utilized the graphic abilities of their more talented members and other available artistic sources to portray biblical scenes in mosaics and wall paintings to impress on the minds of the populace (practically all illiterates) the teachings of their creed. The subjects to be treated were largely selected by the patrons (the clergy), and those subjects naturally were the ones most likely to appeal to the masses. The relation of Mother and Child viewed from the aspect of Divine Inspiration could not but be foremost of the subjects selected as most certain to gain popular attention and to reach the innermost sentiments of humanity. And, from the limner's standpoint, no theme could better enthuse and inspire genius to perfection of execution and the bringing forth of ecstatic pictorial expression. Again, admiration of a master's presentment of the subject obviously was cause of emulation of contemporaries and future artists to produce, if possible, more inspired conceptions of the subject. A natural sequence of these accumulated impulses was the prolific production and reproduction of the Madonna in as many aspects and forms as the differences in genius itself. Hence the innumerable examples of the lovely theme which have present existence. No single subject has been treated so prolifically and from so many viewpoints as this of the divine Madonna. In order to bring within a limited space some intelligible review of such a vast and profound subject the examples are usually divided into different classifications according to the method of treatment of the theme, the different episodes of the entrancing story, etc. Thus we get the Madonna "enthroned," the Madonna "in Gloria," and the "Annunciation," the "Nativity," "Adoration of the Magi," "Flight into Egypt," etc. The earliest depiction of the Madonna is a subject of controversy. Legend tells us Saint Luke, Evangelist, painted pictures of the Holy Virgin, and there are several extant drawings which are claimed to be from his pencil. The Virgin as *orante,* usually termed the "Intercessor," with arms outstretched in Oriental form of supplication, is most generally accepted as the first method of treatment as found in mosaics and on glasses of the 4th or early 5th century, some with the name "Maria" inscribed. An early Assyrian manuscript of the 7th century in the chapel of Venantius has such an *orante* depiction. On ancient Christian sarcophagi the representation of the Holy Virgin is very rare, but in the mosaics of Santa Maria Maggiore (middle of the 5th century) we have the Virgin and Child in medallions on the triumphal arch, and on the spandrils of the arch are the Annunciation, Presentation in the Temple, Adoration of the Magi, Journey of Christ with Mary and Joseph to Jerusalem. Of about the same date is a painting seen in Saint Agnes catacomb, in which the Holy Virgin seated stretches forth her hands in prayer. By 736 the Iconoclasts created much destruction of all kinds of biblical depiction from Byzantine artists, but by 787 comes the revival and the Virgin again appears as *orante,* veiled and aged. In the early representations of the Virgin appears a golden background representing glory and majesty; this gives way later to backgrounds of the angelic host. With the advance or development of the Madonna theme Cimabue (13th century) produced the "enthroned" Madonna, and this great early Florentine master was soon followed with Guido's Siena picture of the subject. And with the arrival of these talented masters the Byzantine stiffness and prescribed rigid rulings of the Greek Church forbidding natural depiction disappears and the human form and garb take on the suppleness of flesh and clothing. It is the beginning of free and highly-developed art, and as such is usually the phase chosen as the first classification with which to deal with detailed descriptions of the theme of the Madonna in Art.

The Madonna Enthroned.— In its early conception the subject depicts the "Queen of Heaven" (*Regina Cœli*), seated in the sky, surrounded by the saints and angels. An early example is Simone's picture in the Siena Council Hall; the Virgin in Campo Santo, Pisa, is another. As Queen of Heaven, having homage

1 Madonna and Child by Bellini



2 Sistine Madonna by Raphael

Photographs from Underwood & Underwood, N. Y.

Photographs from Underwood & Underwood, N. Y.

1 La Pietà by Michelangelo

2 Virgin and Child with Saint Jerome by Correggio

paid her, she is crowned first then veiled. In this conception of the subject the throne is supposed to be a heavenly throne and symbolic of dignity and divinity. Mary is usually garbed in a red tunic as symbol of love and with a blue mantle signifying Heaven. The Child is vested in a tunic till the 15th century, but then generally appears undraped. The Babe generally holds up a hand in blessing, but in the 6th century mosaic of the enthroned Madonna in the Basilica of San Apollinare Nuovo, Ravenna, Mary raises her hand in blessing. The first human figures we see around the throne are the saints, especially John Baptist, the Apostles and the patrons of the particular church to which the work of art is dedicated. Saint John is represented as a child generally bearing a reed cross; at times, as messenger, he has wings. Later patriarchs, prophets, sibyls are in attendance about the throne. Well-known examples are very many and but few can be mentioned. That of Fra Bartolommeo (Baccio della Porta, 1469–1570) is in the Pitti Gallery, Florence; Andrea del Sarto's Madonna di San Francesco in the Uffizi Gallery there stands on a pedestal throne with harpies at its corners (hence sometimes termed "Madonna of the Harpies"). Luini's Madonna in the Brera, Milan, is seated on a coping. Perugino's Madonna (Vatican, Rome) is one of this master's best works and depicts the Virgin seated on a carved and inlaid architectural marble throne. Pinturiccio's Madonna in the chapel of Saint Andrea, Perugia, has the child Saint John standing at the throne's foot. Raphael's Ansidei Madonna (London National Gallery) is reading a book while Saint Nicholas and Saint John Baptist are in attendance at the two sides. The English government paid £72,000 in 1885 for this wonderful painting. Other enthroned Madonnas of Raphael are the Madonna of Saint Anthony (owned privately) and the Baldacchino Madonna (Pitti Gallery, Florence). Among the early exponents of the enthroned depiction were Vivarini, Bellini and Cima; Girolamo dai Libri's altar-piece in San Giorgio Maggiore, Verona, is noteworthy, and Venice is perhaps richest in Madonna creations. Later masters to paint this subject were Titian, Tintoretto and Veronese. Of the early type Cima's picture in the Venice Academy takes about first position; the Madonna is seated on a marble throne having a pillared portico. Palma's beautiful altar-piece in Vicenza is noteworthy among enthroned Madonnas. Bellini excelled in this style and the examples deserve their renown. Ruskin calls his painting in the Venice Academy "One of the greatest pictures ever painted in Christendom in her central art power." The Virgin is accompanied by three saints on each side and three choristers below. His Frari Madonna (Venice) has three compartments, the Virgin occupying the central one. His San Zaccaria Madonna, in spite of its fine execution and beauty of conception and grouping, was created when the artist was over 80 years old. Next we come (late in the 15th century) to Giorgione (who lived only 34 years) who has two Madonnas, one in the Madrid Gallery, the other in Castel Franco. In the latter the throne is exceptionally high, the upper step being above the heads of the accompanying Saints Liberale and Francis. This shows great depth and refinement of feeling in the drooping head and dreaming eyes. While the queenly aspect of these Italian pictures is never displayed with a crown as is frequent on the mosaics dating from the 8th to the 11th century, except in the pictures by Giovanni da Murano and Carlo Crivelli (Venetian school), the Holy Virgin in German art is frequently crowned when enthroned, as in Holbein's Madonna at Darmstadt, that by Van Eyck at Frankfort and that by Memling at Bruges, and Schongauer's at Munich. In the enthroned Madonna of Quintin Matsys in the Berlin Gallery the Virgin is kissing the Child and the northern tendency is vividly displayed in the accessory of the stand containing food. Of modern artists whose enthroned Madonna creations are worthy of mention should be cited Bouguereau, Ittenbach, etc.

The Annunciation.— The angel's announcement to the Spiritual Bride is a subject as prolifically depicted in Christian art as any other. It was a theme displayed everywhere, in every village, street, church or dwelling, in painting or carving. Early we find it in the mosaics, as on the arch of the Santa Maria Maggiore. The attitudes of the Virgin differ in periods or in accordance with the individual conception of the artists. In some the angel stands before the young virgin who kneels in pious submission, or the angel kneels in some; or again, as in Giotto's work, in Padua, both kneel. Later artists picture Our Lady in the Annunciation often as a crowned queen, bejeweled, but in modern work the Virgin and surroundings are treated with simplicity and mystic symbolism is given to the subject. While it is usual that but one announcing angel appears on the scene, Andrea del Sarto, Tintoretto, Francia and Fra Bartolommeo give an angelic choir. Usually the Holy Dove is seen flying toward Mary from the Father. Pisanello's Annunciation in Verona pictures the most beautiful innocence in girlish beauty. Beautiful purity is expressed in the works of Fra Angelico; that in the Oratorio del Gesù, at Cortona, accompanied by the colonnade and scene of Eve's expulsion as accessories, is extremely impressive. In the Uffizi Gallery is a Boticelli Annunciation depicting the angel paying the deepest obeisance at Mary's feet while the Holy Maid stretches out her hands in surprised humility. Other well-known Annunciations are by Simone Martin in the Uffizi, Fra Filippo Lippi, Carlo Crivelli (National Gallery, London), where the scene is produced in a surrounding of magnificent architectural decoration, while Perugino (in Montefalco picture) shows utter simplicity. Paolo Veronese depicts fear as the Virgin shrinks back at the message. Northern creations reveal their source by bringing in such accessories as a spinning wheel, couches, etc. Jan van Eyck places the Holy Virgin by an altar in an alcove with an open book to rest her arm on, her face averted toward the heavenly messenger, who is in a cope and carries a sceptre. Albert Dürer's series of the life of the Virgin depicts in the Annunciation Mary as a German Hausfrau, surrounded by many architectural accessories. In the National Gallery, London, we find Rosetti's work affording very simple treatment in modern depiction, and Burne-Jones gives the scene in a finely constructed painting.

The Nativity.— In the works of the masters

on this subject we find Mary beside her Son's cradle in the act of adoration. Even the early pictures show angels attendant but the veil found in earlier depiction is discarded later. The scene is cast in a cave or cleft in a rock generally transformed into a stable, but there are variations to suit the conceptions of the different masters. In Santa Maria, Trastevere, is a mosaic displaying Mary reposing on a couch in the cleft of a rock. Giotto's school makes the scene a stable of wooden construction; some place the theme in the open with perhaps a ruin or fragment of some structure as accessory. The *swaddled* Babe of the Italian school is, of course, the *bambino* of that country. Orcagna (church of Assisi) places Mary sitting beside the cradle arranging the covering, while Giotto has the Child before her while she is seated on the ground. Perugino's Nativities (in Perugia and Rome) display Mary and Joseph kneeling in adoration of the Babe with angels present. Well known is the Nativity in the London National Gallery by Piero della Francesca (unfinished) in which the Child is lying on the ground with the mother kneeling beside while angels are playing on lutes and singing. That depiction by Luca Signorelli in the same place also shows the Infant on the ground, Mary kneeling beside Him. In the same gallery we have Botticelli's depiction of the scene enacted in a shed, and Carlo Crivelli uses the same surroundings. In Luini's picture an angel holds the Child while Mary kneels with folded arms, her face one of the most beautiful of any of the Madonnas. In most of the above and in others shepherds are portrayed in more or less proximity. In some cases the painting is properly called "Adoration of the Shepherds" on account of their close presence to the Virgin and Child, but later works generally place them in the background. The illumination of the scene frequently (with Rembrandt, Correggio, etc.) emanates from the glowing rays passing from the Holy Babe.

Adoration of the Magi.— This was a favorite subject with the Catacomb dwellers and we find over 20 depictions of the scene in these subterranean galleries. Mary is seated on a throne and the Magi in their tunics and Phrygian caps bring gifts of dishes and baskets. Their number runs from three to six. The early method of treatment makes the Babe rest in the mother's arms, but in the Santa Maria Maggiore (Rome) mosaic the Child is seated on a pedestal with hand upraised in benediction. Usually we find Him in His mother's lap. The emanating glory of the Babe frequently is the source of light and the benediction act is frequently His pose. An Adoration of the Magi mosaic (about 6th century) is in the chapel of San Apollinare Nuovo at Ravenna, in which the Magi lead a procession of female martyrs bringing their crowns as votive offerings to the Madonna. Giotto's painting in Padua places the scene in a stable while Fra Angelico (National Gallery, London) chooses the entrance of a cave as the scene of the King's devotions. In Filippo Lippi's 'Adoration of the Kings' in the Uffizi, Florence, Mary is located in a wide landscape in which figure a host of persons surrounding her. Other noted Adorations are by Baldassare Peruzzi (London National Gallery), Pinturicchio, Mehling (Bruges), Rogier van Weyden (Munich), Rembrandt; Rubens painted 15. of which one is in Madrid, another in the possession of the Duke of Westminster.

Flight into Egypt.— In pictures brought under this title Mary is sometimes seen seated on an ass with Joseph walking beside; the ox which tradition says accompanied them rarely appears in the paintings. Sometimes an angel leads the ass. Well-known depictions of this scene are by Giotto (Padua), Fra Angelico (Florence), Pinturicchio, Memling (Munich).

Riposo.— This phase of the Madonna series is more popular with artists of the past than the 'Flight.' It depicts the Holy Family after the tedious journey through the desert resting in a fertile country surrounded by fruit trees, Mary bathing the Child, etc. It was greatly favored by German and Flemish masters (Albrecht Altdorfer's in Berlin, Lucas Cranach, Martin Schongauer's in Vienna, etc.).

Pastoral Madonnas.— From the 15th century a new style of treatment of the Madonna theme arrives. It is the placing of the Virgin in a landscape surrounding. There are but few, such as Raphael's earliest Madonnas. Three most noted are La Belle Jardinière (Beautiful Gardener) in the Louvre; Madonna in the Meadow (Madonna in Grünen) in Belvedere Gallery, Vienna; and the Cardellino Madonna (Madonna of the Goldfinch) in the Uffizi, Florence. All three among the most prized paintings in the world and too popularly multiplied to need description. Raphael's later work, the Casa Alba Madonna, is less well known with its turbaned Roman patrician depiction of the Virgin. Leonardo da Vinci's Madonna of the Rocks gives the Holy Virgin, in the foreground of a grotto, grouped with the Child and the infant John. Luini painted a pastoral Madonna (in the Brera, Milan), but very noted is Correggio's 'La Zingarella' (Gipsy) or 'Madonna del Corniglio' (Naples) which is posed in a lovely landscape as is also his kneeling Madonna in the Uffizi, both of which always call forth admiration. Palma Vecchio's 'Santa Conversaziones' in Naples, Dresden, Munich and Vienna are public favorites. In the *pastoral* class of Madonnas must be included the three "enclosed garden" examples by Francia (Munich), Filippino Lippi (Florence) and by Schongauer, in which the Virgin and Child are surrounded by a hedge of roses with a landscape in the rear perspective.

Domestic Groups.— This method of depiction of the biblical scene was vogue among painters of the middle 15th century. They consisted of the Holy Virgin and Child associated with Saint Joseph, Saint Elisabeth and her son, and frequently other attendants. A number depict Saint John Baptist child playing with the Holy Infant; Saint Ann, mother of the Holy Virgin, appears in some; da Vinci even depicts (in a cartoon) Our Lady seated on Saint Ann's knees. Girolamo dai Libri (London National Gallery) painted such a group, and Perugino has a work in which Saint Ann rests her hand on the Virgin's shoulders while boys and women relatives are grouped about. Very popular are the groups that include the infant Saint John Baptist playing with the Child (as Raphael's in National

Gallery, London). Both Botticelli and da Vinci created pictures of Saint John adoring the Infant. In the same inspiration is Luini's 'Madonna dell' Agnello' at Lugano. Another popular group subject adopted in pictures by Titian, Perugino, Correggio, Parmigiano, Borgognone, Memling, etc., is the 'Marriage of Saint Catherine,' in which the Child is placing a ring on the finger of the saint. Good modern representations of such groups are by P. A. J. Dagnan-Bouveret in the New Pinakothek, Munich, in which the holy mother, depicted as a peasant, is seated on a bench in the carpenter's shop and the Child at her breast, under her mantle, illuminates and pierces with rays of glory the coarse textile. But, though numerous, both French and German modern paintings of the Madonna lack the devotion or even inspirational features which give such glory and beauty of conception to the early Italian masters and those of the Renaissance.

Madonnas in Domestic Surroundings.— These include the 'Holy Family' series. The worldly environment in depiction of this mystic religious subject has found few exponents, and those confined largely to northern artists. To the German and Dutch the maternal dignity of the *Hausfrau* appeals so strongly as to call from their limners' hands sacred Madonnas in everyday household surroundings. Of such we have pictures by Quintin Matsys (Munich) with its Flemish sleeping apartment, having the Virgin and Child as occupants; the 15th century German artist Schongauer (Belvedere Gallery, Vienna) gives Joseph feeding the cattle from hay in his arms looking with fondness in the doorway at the Virgin holding a bunch of grapes while the Child nestles in her lap. But in Italy, Giulio Romano in his Madonna della Catina (Dresden) portrays the Divine Babe in a basin (*catina*), ready for the bath, while the infant Saint John pours water from a ewer. The Madonna dell' Impannata (of the papered window), formerly considered as Raphael's and later ascribed to Romano, pictures Elisabeth, Mary Magdalen and the child Saint John beautifully grouped with the Virgin and Child. The picture of the French artist Mignard (Louvre) called 'La Vierge à la Grappe' is well known. Salembini's Holy Family (Pitti Palace) depicts the gambols of the Child Jesus and Saint John with puppies. Rembrandt's two 'Ménage du Menuisier' (carpenter's home), in the Louvre and Petrograd, picture a combined living and workroom with Joseph at his bench and Mother and Child as central subjects; his painting in the Munich Gallery also brings Saint Joseph as carpenter into the scene.

Mater Amabilis.— The Madonna of Love. Some consider this the most popular type of the Madonna in Art. The depiction of a mother's love is one of the most endearing themes of the artist for all humanity. Raphael's sublime depictions, of course, lead in this type with his Madonna Tempi (Munich), in which the Virgin Mother presses her lips to the Child's cheek. His Conestabile (Petrograd) and Ansedei Madonnas and Babe peering in companionship into the Book of Wisdom belong here, also the Holy Family of Francis I, in which she stoops to lift the Child from the cradle and the Madonna della Sedia (chair Madonna) in the Pitti Gallery, Florence, embracing the Infant. Correggio's painting in the Uffizi really belongs to this series with the Virgin stooping over the Babe, and his Madonna del Cesta (of the basket) in the London National Gallery, named after the basket (*cesta*) lying on the floor; and his Madonna del Latte (Petrograd), also his Madonna della Scala (of the Staircase) in Parma are surely of this category. Titian sometimes created such a Mother of Love as in his 'Vierge au Lapin' (Louvre) in which she is calming a rabbit for her Child to play with, also the Madonna with Saints Ulfo and Brigida (Madrid) in which the Child is accepting a gift of flowers from the latter saint, and another in the Uffizi Gallery. Of pictures portraying the Holy Mother suckling her Babe there are a number, best known perhaps being the Madonna of the Green Cushion (Louvre) by Andrea Solario. And the Mother watching the sleeping Babe is another phase of the theme treated by masters of art, such as Raphael's Madonna of the Diadem (Louvre), others by Guido Reni (Rome), Sassoferrato, Carlo Dolce, etc. And among northern artists the Mater Amabilis has been pictured by Dürer, Holbein (Meyer-Madonna), Rembrandt, Rubens, van Eyck, Schongauer. Among modern artists who have created fine pictures of this theme are Gabriel Max, Bouguereau, Carl Müller, N. Barabino, Dagnan-Bouveret, Guay, Macomber, Bodenhausen.

Madonna in Gloria.— The Madonna in the Sky. These usually represent a landscape below and the Madonna in the upper sky. In the Madonna dell Stella by Fra Angelico, in San Marco, Venice, a star is located over the head posed on the veil, the figure is full length surrounded by a mandorla of golden rays. The Madonna of Saint Sebastian (Dresden) has a surrounding of cherubs and clouds with saints below. Moretto (Brescian school) treated the theme traditionally, but very lovely is his Madonna of San Giorgio Maggiore, Verona, which shows very naturalistic effects in atmosphere above and depicts Saints Cecilia, Lucia, Catherine, Agnes and Barbara beneath; another of his is in the Berlin Gallery, a mandorla encompassing Mother and Child. Three paintings on this subject are in Venice by Gianfrancesco Caroto, also one by Cavazolla (Morando); these all are of the Brescia school. Tintoretto and Titian produced creations of this theme. Raphael gave us the Foligno Madonna (Vatican), which is greatly admired, but his Sistine Madonna (Dresden) brings us to the apex of highest inspiration with its majestic full-length figure in perfect poise and the charm of the cherubs surpasses all found in other depictions. Later came the selection of the crescent moon on which artists posed the Madonna in Glory; the exponents of this style are Albrecht Dürer, Sassoferrato (Vatican), Tintoretto (Berlin). Modern painters of the theme are Bouguereau, Bodenhausen, Defregger, etc.

Pietà.— This is probably the most popular and touching conception of the Madonna in Art. Every Roman Catholic church has one. It is the representation of the Virgin displaying the complete sacrifice. Francia's beautiful conception of the theme is shown in his painting in the London National Gallery, in which the outstretched limp body of the Crucified

One lies across the lap of the Holy Virgin while an angel on either side attends. Luini portrays the Head, crowned with thorns, falling back on the Mother's brow while she supports Him. The same scene with Saint John and Mary Magdalen attending is often termed a Pietà but correctly the groups should consist of Mother and the lifeless Savior, perhaps with angel or angels attending. Giovanni Bellini's painting in the Ducal Palace, Venice, shows the Crucified One being raised from the tomb by Mary, His head resting on her face, Saint John holds up His arm; another by this master is in the Uffizi Gallery. Crivelli painted two very pathetic Pietàs, one of which is in the Vatican. In the Pitti Palace is a Pietà by Fra Bartolommeo of most touching aspect. But Michelangelo's great group in the Vatican is said by many to be unsurpassed in its sublimity.

Mater Dolorosa.— The Divine Mother in anguish. This theme has called forth from the great painters facial expression of excruciating human agony of the most touching and pathetic depiction ever accomplished. The true pathos of sorrow displayed by the Spanish school is very prominent, Murillo's depictions excelling in their pictured anguish and tears. Tradition poses the hands clasped, the veil casting a shadow on the Virgin's head, the face, with its welling tears, glancing upward. At times the Madonna is placed at the foot of the Cross. For the most part the face is of middle age, except as with Michelangelo, who depicts youth and to a critic declared "Purity enjoys eternal youth"; Reni and later artists frequently depict a young maiden. Many of the paintings of the Mater Dolorosa type are but the head, others half-length figures. A beautiful example of Quintin Matsys' is in the London National Gallery. Many of the creations are disfigured by the unnecessary swords depicted as piercing the Virgin's bosom, referring, of course, to Simeon's prophesy. They are supposed to emphasize the pathetic subject — Vandyck uses the weapons.

Other phases of the Madonna theme pictured by masters are many but space forbids further description. Of such are the subjects known in the art world under the titles: "Purification," "Presentation to the Temple," "Assumption," "Last Judgment," "Seven Joys and Seven Sorrows of the Virgin," etc.

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MADOQUA, măd'ō-kwą, a diminutive antelope (*Cephalolophus abyssinicus*), one of the duiker-boks (q.v.), common in Abyssinia. The fore-parts are rufous, but gray is the prevailing hue. The same name is sometimes applied to other very small north African antelopes, as the Beni Israel.

MADRAS, British India, the capital of the presidency of Madras, on the Coromandel coast, lies on an open, sandy shore, exposed to the swell of the Bay of Bengal, which breaks upon the beach with great violence. It is 835 miles southwest of Calcutta. A modern harbor formed by two piers obviates the former dangerous passage through the surf. The city is built on level ground and with its nine suburbs occupies 27 square miles. The chief commercial portion is Black Town, about a mile square, closely and irregularly built, containing the native and East Indian (or mixed) population, with a few European merchants and their families. On the south is the ancient Portuguese settlement Saint Thomé founded in 1504, with a Roman Catholic cathedral. One of the chief objects of interest is Fort Saint George, which commands the Black Town and the network of roads, and may be considered the nucleus of the city. It was built in 1639, and is admirably situated for the defense of the town and shipping. It contains a church, the barracks, and an arsenal. The government-house, the cathedral of Saint George and some of the other churches and public buildings, are handsome structures. Besides the university, the Presidential College and a medical college, supported by government, there are large missionary institutions. The public park, containing a small zoological collection, is the chief recreation ground of the city. From the meridian of the observatory connected with the university all India takes its time. Madras is the chief seat of the provincial government offices, of the Supreme Court, a board of revenue, marine board, etc. Notwithstanding the disadvantages of its position it is a place of great trade, and a new harbor has greatly tended to increase traffic. The landing and shipping of goods is effected partly by lighters to the pier-head inside the harbor, and partly by the old *massula* or surf-boats, which land their cargoes on the beach. The imports are chiefly manufactured goods from the United Kingdom, especially cottons, wines, spirits, metals, stationery, etc. Among the principal exports are cotton, grain, indigo, coffee, tea, hides, oil-seeds, dye-stuffs, pepper, etc. The chief industries are connected with the preparation of goods for export, such as coffee pressing and cotton cleaning. Cotton-spinning factories have been established at Madras. The country at a short distance from the city presents a remarkable contrast to its barren sandy shore, having the appearance of a fine park. The mean annual temperature is 82°, which rises in the hot weather to 96° in the shade. The city has railway communication with all the principal places of India, has good water supply and sewerage systems, is lighted by electricity and gas and is administered by a body of 32 commissioners.

Madras was founded in 1639 by the English, who obtained the grant of a piece of ground for the erection of a town and fort (Fort Saint George) from the Rajah of Chandgherry. It soon became a flourishing city and the chief station of the English on the Coromandel coast. In 1746 it was taken by the French, who kept it until 1749, when peace was made and the place was restored to the English by the Treaty of

Aix-la-Chapelle. In 1758 it was again besieged by the French under the celebrated Lally, who was obliged to retreat after a siege of two months. Pop. about 518,660, of whom 79 per cent are Hindoos, 11 per cent Mohammedans and 8 per cent Christians.

MADRAS, ma-drăs', British India, a presidency occupying the southern portion of the Indian Peninsula. It stretches from the Bay of Bengal to the Arabian Sea, almost enclosing Travancore and Mysore, while a long, narrow portion extends along the west side of the Bay of Bengal till it meets the Bengal province about 70 miles from the mouth of the Mahánadi. It has a total area, excluding native states, of 141,075 square miles, the area of the native states being 10,087 square miles. Jaipur and Haidarabad bound it on the northwest, while the west borders for a short distance with Bombay. The chief mountain ranges are the Western Ghâts, the Eastern Ghâts and the Nilgiri Mountains. The principal rivers are the Godâveri and Kistna, with their tributaries; and the North Penner, South Penner, Palar, Kaveri, Coleroon and Vaiga. There are no lakes of any importance, but many salt lagoons or inlets of the sea. Extensive forests yield teak, ebony and other valuable timber trees. The wild animals are those common to other parts of India, the elephant, tiger, chetah, bear, bison, elk, spotted deer, antelope, jackal, wild hog, jungle sheep, etc. The climate generally is reckoned the hottest in India, but differs wildly in different localities according to elevation. Of the population, 68 per cent is engaged in agriculture, and 86 per cent of the cultivated area is under food crops. The soil along the coasts, particularly that of the Carnatic, is for the most part light and sandy; inland it consists of a decomposed syenite impregnated with salt, which in dry weather covers the ground with a saline efflorescence. The district of Tanjore on the banks of the Coleroon is esteemed the granary of southern India. The principal vegetable productions are rice, wheat, barley, maize and all the other grains common in India; sugarcane, areca, yam, plantain, tamarind, jack-fruit, mango, melons, cocoanuts and a variety of other fruits; ginger, turmeric, pepper, tobacco, hemp and cotton, for the growth of which the soil seems to be particularly well adapted. Tea is grown to some extent. Weaving is the only indigenous art of any consequence, and cotton cloth, muslins, carpets and silks are manufactured to a limited extent. The grand total of seaborne trade for 1913–14 was rupees 581,593,000. Of external trade 63 per cent is with the British Empire, and 42 per cent with the United Kingdom. The government of the presidency is vested in a governor subordinate to the governor-general of India. The revenue usually exceeds the expenditure, but the apparently healthy condition of the finances is largely illusory, as the presidency has been living on windfalls in the shape of grants from the Indian government. At the head of the educational institutions is the Madras University, an examining body, granting degrees in arts, law, medicine and engineering. About 600 students annually graduate in arts. There are various schools and colleges affiliated to the university.

The province is divided into 22 districts with a population of about 41,402,000. The native feudatory states of Travancore, Cochin, Banganapalle, Puddakotai and Sandur, had a total population of about 4,813,000. The languages are Tamil, Telugu (which are spoken by the great majority of the inhabitants), Canarese and Malayalam, with some lesser dialects spoken by the more barbaric tribes on the mountains; Mahrathi and Gujerathi prevail in the northern and northwestern parts of the presidency; Uriya in the northeast; while Hindustani is the language spoken everywhere by the Mohammedans. Capital, Madras (q.v.). See also INDIA.

MADRAS HOUSE, The, is not only an admirable example of the work of Granville Barker as a dramatist but also of the modern type of play written by, and for, those who conceive of the theatre as a place where it is permissible, even enjoyable, to *think* as well as to *feel.* It does not depend for its effect on thrilling situations, violent emotions or cunningly devised mystery but depicts the dramatic interplay of character and circumstance under normal conditions with a skill, insight and humor which afford even more pleasure, perhaps, to the reader than to the spectator. Of all the wide variety of human relations involved in the play, none are dealt with, so to speak, in actual crisis and there is a resulting lack of dramatic tension, but the author succeeds, nevertheless, in making one acutely conscious of the intensity and force of the emotions that underlie the surface not only of the play but of life. The two main themes are business and sex. The particular aspect of business which is presented is one that is unfamiliar in America, namely, the "living-in" system, inherited from the days of guilds and apprentices in England, under which clerks and other employees receive board and lodging as part of their wages. It is obvious that in a large "drapery establishment" employing both men and women, like the Madras House, such an arrangement would be likely to give rise to social complications. The business theme, therefore, although open to the reproach of being local in its application, may boast the charm of novelty for Americans. The sex interest, on the contrary, is of the familiar, universal, all-pervading variety. It inter-penetrates the life of the conventional suburban family, into which we are introduced in the first act; it comes frankly to the fore in the second, in the case of Mr. Brigstock, "third man in the hosiery," and one of the "lady shop assistants;" it pulls the strings during the sale of Madras House to an American millionaire in the third act; and it looms largest of all in the last act, in which that unconscionable old lady-killer, Constantine Madras, finally renounces his family and the trammels of conventional morality and turns Mohammedan. In this, as in his other plays, Barker, following Bernard Shaw's lead, omits the customary list of *dramatis personæ* and introduces his characters in a sort of literary preface to each act which is no less interesting and illuminating than the dialogue. "The Madras House" was written in 1910 and was first produced at the Duke of York's Theatre in London on 9 March of the same year under the direction of the author.

MADRAZO, mā-drā'thō, **Raimundo de,** Spanish painter: b. Rome, Italy, 24 July 1841. He studied art under his father, Federigo de Madrazo, and Léon Cogniet in Paris. He has been very successful in portrait and genre and numbered many prominent Americans among his sitters. He is equally happy in pastel and oils, and his 'Fête during the Carnival' in Mrs. W. K. Vanderbilt's collection is as brilliant in conception as in technique. Among his most celebrated portraits are those of the Queen Regent of Spain; the Countess Pillet-Will; Mrs. Cornelius Vanderbilt; Mrs. Whitney; Miss Anne Morgan; Madame Madrazo; Samuel P. Avery. 'The End of a Masked Ball' was awarded a first class medal at Paris in 1878 and was subsequently purchased by W. K. Vanderbilt. Other genre works all of a high order are 'Fête during the Carnival'; 'Girls at a Window' (both in Metropolitan Museum, New York); 'Lady with a Parrot' (purchased by W. A. Clark, New York); 'Lady with Guitar'; 'Déjeuner of the Infanta'; 'Pierrette.' Madrazo was made commander of the Legion of Honor. His brother, RICARDO (b. 1852), was also a pupil of his father and achieved some success as a portrait and genre painter.

MADRAZO Y KUNT, Federigo de, Spanish painter: b. Rome, 12 Feb. 1815; d. Madrid, 11 June 1894. His father, José de Madrazo y Agudo (1781–1859), was a painter of note and from him Federigo received his early instruction. Subsequently he studied under Winterhalter at Paris. His early works are 'The Resurrection of Christ' (1829); 'Achilles in his Tent'; 'The Continence of Scipio' and portraits of Baron Taylor and Ingres; 'Godfrey Proclaimed King of Jerusalem' (1837). Thereafter he went to Rome and while there painted 'Maria Christina' (1843); 'Queen Isabella'; 'The Duchess of Medina-Cœli'; 'Countess de Vilchès' (1847), and several portraits. In 1873 he was elected foreign member of the Paris Academy of Fine Arts. After his father's death he became director of the Prado Gallery and director of the Academy of San Fernando. He founded *El Artista,* the pioneer of Spanish art journals; it was followed by *El Renacimiento* and *El Semanario pintoresco.* Of his later works the best known are the genre pieces, 'The New Song'; 'The Cigarette'; 'The Musical Matinee,' etc. His brother, LOUIS DE MADRAZO, was also a painter. His best work is 'The Burial of Saint Cecilia' (1855).

MADRE DE DIOS, mä'drĕ dĕ dē'oos, or **AMARU-MAYU,** Bolivia, a river, the chief affluent of the Beni, rising in the Carabaya Mountains, Peru, about 50 miles east of Cuzco, and after an easterly course, south by north, of 900 miles, chiefly through the Bolivian department of La Paz, uniting with the Beni at Rivera Alta, where it is 1,500 yards wide. It was explored in 1865 under the auspices of the London Geographical Society, and since 1881 has been the highway for the exploitation of the rubber forests along its course.

MADREPORE, a genus of coral-forming polyps (see CORAL AND CORAL ISLANDS) containing numerous species from the warmer and tropical seas of all parts of the earth. The true Madrepores increase by budding, the result being usually large branching colonies in which the coral between the cups containing the polyps is perforate and spiny. The different species frequently attain large dimensions and constitute one of the most important elements in the formation of coral reefs. The polyps have 12 septa and 12 tentacles, 6 being large, the other 6 smaller, while a peculiar feature is the presence of 6 U-shaped tubes connected with the œsophagus at either end. The term *Madreporaria* is sometimes used to include all polyps in which the parts are arranged in multiples of six, and which secrete coral on the external surface of the body.

MADRID, ma-drid' (Sp. mä-drēd'), Spain, the capital of the kingdom and of the province of Madrid, a part of New Castile, situated near the centre of the country, on the left bank of the Manzanares, a sub-affluent of the Tagus. It is built on several low and irregular sand-hills on a plateau 2,140 feet above sea-level, and is surrounded by a barren and extensive plain, treeless save in the vicinity of the city, and stretching northward to the snow-capped Sierra de Guadarrama. In winter the climate is exceedingly severe, and even in summer, when the heat is excessive, piercingly cold blasts descend from the mountains. The prevailing winds are the parching southeast *Solano,* and the icy north wind from the Guadarrama. The climate is described in a Spanish proverb as "three months of winter and nine months of hell." The temperature ranges from 18° to 105° F.; is subject to frequent and sudden changes; and between the sunny and shady sides of a street the difference of temperature is sometimes as great as 20°. Madrid was until recently surrounded by a wall 20 feet high, pierced by 5 large and 11 small gates; of these gates 3 remain: the Puerta de Alcala on the east, the Puerta de Toledo on the south, and the Portillo de San Vicente on the west. The streets are distributed somewhat irregularly around the Puerta del Sol, which is in the centre of the capital. The principal streets are broad, long and airy; and the houses are in general well constructed, substantial and of good appearance.

In common with most European capitals, Madrid has undergone much modern improvement; the streets are traversed by electric and horse car lines; are lighted by gas and electricity; the telephone system is efficient; and sanitation has been much improved. The former abundant and pure water supply, is, however, inadequate to the demands of the growing population. Madrid has no edifices of great antiquity. The royal palace, situated at the western extremity of Madrid, is one of the most magnificent in the world. It occupies the site of the original Alcazar (castle) of the Moors, and is of enormous extent, being 470 feet each way, and 100 feet high. The architecture is a combination of Ionic and Doric. It contains a small but splendid Corinthian chapel, and a library of nearly 100,000 volumes, and the armory is one of the finest in the world. The Chamber of Deputies, which occupies an area of 42,700 square feet, has a hexastyle Corinthian portico on the grand façade, destined for the entrance of royalty on state occasions. On the two lateral façades are the entrances for the members. The Royal Exchange and the Bank of Spain are two modern imposing buildings.

Madrid stands far behind many provincial towns as regards its churches, which are, with exception of a few attached to conventual establishments, poor and of indifferent artistic merit. The church of San Jeronimo el Grande is probably the most distinctive. The most important of the charitable institutions are the military hospital, an extensive building in the northwestern corner of the city; and the Hospicio of San Fernando, with schools for both sexes, the pupils being taught various handicrafts. At the southeastern corner of the city stands the general hospital. There are also hospitals for orphans and for foundlings, and numerous charities, mainly of a religious kind.

Madrid has 72 public squares, which are generally irregular both as regards their form and their edifices, as well as deficient in decorative monuments. Of these the Plaza Mayor is one of the largest and most regular. The Plaza de Oriente is adorned with 40 statues of Gothic kings, as well as those of the Asturias, Leon, Castile and Aragon. In the centre is a fine equestrian statue of Philip IV. Among places of amusement the most popular is the Plaza de Toros (bull-ring), a building which is about 1,100 feet in circumference, and capable of containing 12,000 spectators. The Prado, a sort of wide boulevard, about two miles long, running north and south on the east of the city, is the chief promenade, and beyond it is the chief public park, including the Buen Retiro gardens, near which are the new handsome building for various ministerial departments and the new station of the Southern Railway Company. The Royal Picture Gallery which stands in the Prado contains more than 2,000 pictures, including a great many by all the best masters, especially those of Spain. There are also good pictures in the Academy of Fine Arts. The National Library, founded by Philip V, contains 650,000 volumes. The Library of San Isidoro consists of 66,000 volumes. The University of Madrid (the most important in Spain) which arose out of that of Alcalà de Henares, founded in the 15th century, has an average attendance of 5,000 students. There are besides numerous other schools, academies and colleges, public and private, including a normal school, a deaf and dumb institution, a normal school for the blind, a commercial school, schools for engineers, a conservatory of music, an academy for the fine arts with a picture gallery, a veterinary college, an academy of medicine and surgery, etc. The famous monastical and palatial Escorial (q.v.) is 27 miles northwest of the city.

The industries have shown a remarkable development during the last decade, the chief manufactures being tobacco, leather goods, chocolate, beer, shoes, boots, plated ware, coaches, gloves and fans. There is a royal carpet and tapestry factory in the Pacifico suburb. The commerce is important, as Madrid is the entrepôt for all the interior provinces. Retail business is mainly in the hands of foreigners, mostly French, but most of the wholesale trade is carried on by native houses. Madrid has railway communication with Paris and Lisbon, and the chief cities of the Peninsula.

Madrid in the Roman period probably was the insignificant hamlet Majoritum. Under the name Majorit it appears as a Moorish outpost of Toledo when captured in 932 by Ramiro II of Leon. Henry IV about 1461 made some additions to the older town, which was placed on the western eminence over the river. Madrid only began to be a place of importance under Charles V. Declared the seat of the court by Philip II in 1560 the city rapidly grew up at the expense of the older and better situated capitals. It was the creation of a century, and its increase was very slow after the age of Philip IV. The gross mistake of a position which has no single advantage except the fancied geographical merit of being in the centre of Spain was soon felt, and on Philip II's death his son, in 1601, endeavored to move the court again to Valladolid, which, however, was found to be impracticable, such had been the creation of new interests during the outlay in the preceding reign. Madrid was entered by the French under Murat, 23 March 1808, but they were soon obliged to evacuate it. It was again held by the French from 1809 to 1812, when the Duke of Wellington entered it and restored it to the Spaniards. After the deposition of the crown by King Amadeus in 1873, Madrid, along with the rest of Spain, suffered greatly from the anarchy caused by the struggles between the Republicans, Carlists and Socialists. Pop. about 599,807. The province of Madrid covers an area of 3,084 square miles, and has a population of about 920,493.

MADRIGAL, a short lyric poem generally on amatory subjects. Those of Tasso represent the finest specimens of Italian poetry.

MADRONA, a large and ornamental tree of California (*Arbutus mensiesii*), of the heath family, which often grows nearly 100 feet in height. It has a wide-spreading head, small evergreen leaves and the limbs and large parts of the trunk, where the thin outer bark easily peels off, are bright red. It grows in the foothills, and up to a moderate elevation, but not naturally in the valleys. It is a near relative of the strawberry tree of Europe.

MADSTONE, a vegetable substance or stone which when applied to a wound caused by the bite of a mad dog is said to prevent hydrophobia. The most famous one in the United States is owned by the descendants of a family named Fred, in Virginia. This stone was brought over from Scotland in 1776. It is said to be the one spoken of by Sir Walter Scott in 'The Talisman' and has been religiously preserved as one of the most valuable relics of the age. It is about two inches long by one inch broad, and about half an inch thick, and is of a chocolate color. When applied to the wound it adheres till all the poison is absorbed, when it drops off. It is then soaked in warm milk or water for a time, and when removed the liquid is found to be full of a greenish-yellow scum. It is said that of the 130 cases in which it has been applied for the bite of a mad dog, none ever suffered from hydrophobia. There are said to be three authenticated madstones in the United States.

The belief in a madstone was common hundreds of years ago in the East, and travelers in India in 1677 and 1685 make mention of it. Tradition said it grew on the head of certain snakes. George F. Kunz, a New York expert in gems, identifies the madstone, or snakestone, of the East, with the stone known as tabersheer, which is a variety of opal found in the joints

of the bamboo in Hindustan and Burma. This stone is formed of juice which by evaporation becomes mucilaginous, then a solid substance, and when placed in the mouth will adhere to the palate or cause water to boil. Sir David Brewster says it is found in the joints of diseased corn-stalks and is formed by sap depositing silica.

MADURA, mä-doo'rä, southeastern Asia, an island of the Malay Archipelago, Dutch East Indies, off the east end of Java, from which it is separated by the Strait of Madura. The island is about 105 miles long east to west, and 30 miles broad, with an area of 1,770 square miles. Madura forms one of the 17 Dutch residences or provinces into which Java and Madura are divided, and is administered by a governor or resident. The Dutch first landed in Madura in 1747. It is undulating but not mountainous, and though in general well watered, in some places, especially on the coast, there is a want of water, and the soil is unfertile. The interior, however, is fertile, though not so productive as Java. Maize, cocoanuts, tobacco, Jamaica pepper, tamarinds and salt are the chief products; stock-raising is an important industry; and the exports include also birds'-nests, country cloths, white and striped, poppy-oil, rattan-mats and baskets, etc. The chief towns are Bangkalang, Pamekasan (the capital, pop. 8,407), and Sumanap (pop. 22,110). Pop. 1,843,601, of whom 4,734 were Chinese and 621 Europeans.

MADURA, southern India, the capital of a district of Madras, 344 miles by rail southwest of Madras. It was the capital of the ancient Pandhyan kingdom, for over 2,000 years was the political and religious capital of southern India, and is noted for its interesting architectural monuments, chief of which is the Temple of Minarchi, dating from almost prehistoric times, restored and added to by Tirumulla Nayak (1622–62). It ranks fourth among the seven strongholds of Hinduism, and occupies a parallelogram of 56,000 square feet containing 50 buildings. The city was known to the Greeks and Romans. Cotton and tobacco manufactures and coffee mills, are the principal industries. Madura is the seat of Catholic and American Protestant and other missions, and has several high-grade educational institutions. Pop. 134,130.

MADVIG, mäd'vĭg, Johan Nikolai, Danish scholar: b. Svanike, island of Bornholm, 7 Aug. 1804; d. Copenhagen, 13 Dec. 1886. Educated at Frederiksborg and Copenhagen, he was from 1829 till 1879 professor of Latin in the University of Copenhagen. He took a profound interest in the politics of his country, and from 1848 till 1851 was Minister of Education and Religion. He is best known by critical editions of Latin classics and by his Latin grammar translated into English and most European tongues. His chief works are 'Emendationes in Ciceronis Libros Philosophicos' (1828); 'Cicero's De Finibus Bonorum et Malorum' (1839, amended 1876); 'Ciceronis Orationes Selectæ Duodecim' (1830); 'Cicero's Cato Major and Lælius' (1835); 'Opuscula Academica' (1834–42; new ed., 1887); 'Emendationes Livianæ' (1860); 'Livii Opera' (with Ussing, 1861–66); 'Adversaria Critica' (1871–84); 'Latin Grammar' (1841); 'Greek Syntax' (1846); 'Constitution and Administration of the Roman State' (1881–82); 'Autobiography' (published posthumously, 1887). Consult Sandys, J. E., 'A History of Classical Scholarship' (Cambridge 1908).

MÆANDER, mē-ăn'dẽr, now **MENDERES**, Asiatic Turkey, a river which rises in Phrygia not far from Celænæ. It forms the boundary between Caria and Lydia, and flows into the Icarian Sea between Priene and Myus, opposite Miletus. It covers a course about 200 miles long, is deep and narrow, and navigable only for small vessels. It was celebrated among the ancients for its winding course, and gave its name to the intertwined purple borders on mantles and other dresses, as well as upon urns and vases.

MÆANDRINA, mē-ăn-drī'na, one of several genera of brain corals, so called from the elongate and meandering cups containing the polyps, which give a spherical mass of these corals an appearance strikingly like the human brain with its convolutions. This appearance is due to the fact that the polyps in their growth do not completely divide, but stretch out into long bands, frequently branching, with many mouths and tentacles, and a common body and digestive cavity. Brain corals occur in all tropical seas, several species being found in Florida and the West Indies. Their solid masses make them important factors in the formation of coral reefs.

MÆCENAS, mē-sē'nąs, **Gaius Cilnius** Roman nobleman: b. between 73 and 63 B.C.; d. 8 B.C. He was the friend of Augustus, and patron of Virgil and Horace. It is unknown where he received his education, but he was intimate with the literatures both of Greece and Rome, and was himself an occasional writer in prose and verse. We first hear of him authentically (40 B.C.) as negotiating a marriage between Octavianus and Scribonia; and in the same year he contributed materially to bring about the Peace of Brundisium, by which Octavian and Antony were reconciled. Two years later he was again employed in reconciling these self-willed potentates; and 36 B.C. he was twice dispatched by Octavian from Sicily to Rome to quell disturbances which had broken out there. He was for these services entrusted with the administration not only of Rome, but of all Italy, when Octavian became emperor with the title of Augustus. His palatial residence and gardens on the Esquiline were the rendezvous of all the *literati* of Rome, and of numerous parasites. But those admitted to his intimacy were the greatest geniuses and scholars of Rome, among them being Virgil and Horace. To the intercession of Mæcenas, Virgil was indebted for the recovery of his farm, and Horace also owed to him many favors. Consult Baehrens, 'Fragmenta Poetarum Romanorum' (Leipzig 1886); Harder, F., 'Fragmenta des Mäcenas' (Berlin 1899).

MAELAR, Lake of. See MÄLAR.

MAELSTROM, mäl'strŏm, or **MOSKOESTROM**, Norway, a rapid current or tidal whirlpool off the northwest coast immediately southwest of Moskenesoe, the southernmost of the Lofoten Isles. The current runs with the tides alternately, six hours from north to south and six hours from south to north, producing

immense whirls. The depth of the water around, supposed at one time to be too great to admit of soundings, has been ascertained not to exceed 20 fathoms, with a bottom of rocks and white sand. Immediately to the west the soundings are from 100 to 200 fathoms. The whirlpool, idealized by mediæval and later writers, including Edgar Allan Poe, is greatest at high or low water. When the wind is northwest and opposed to the reflux of the waves it attains its greatest fury, and becomes extremely dangerous, but in ordinary circumstances it may be traversed without difficulty.

MAES, or **MAAS,** mäs, **Nicolas,** Dutch painter: b. Dordrecht, 1632; d. Amsterdam, December 1693. He entered the studio of Rembrandt at Amsterdam about 1650 and studied there about four years, attaining a style of execution and coloring so similar to that of his master that many of his paintings were for a long time believed to be Rembrandt's work. He returned to Dortrecht in 1654 and in the succeeding 10 years did his best work, which retained the influence of Rembrandt, particularly in coloring. From the time of his going to Antwerp in 1665 his style changed and he abandoned the domestic genre type of work for that of portraiture, and his subsequent pictures show the influence of Van Dyck. So different were the characteristics of the two periods that at one time it was believed that there were two artists of the same name. Of his earlier and better period notable examples are 'The Reverie' (Ryks Museum, Amsterdam); 'Card Players' (National Gallery, London); 'The Eavesdropper' (Six Gallery, Amsterdam); 'Young Girl Peeling an Apple' (Metropolitan Museum, New York); 'Hagar's Departure,' long believed to be a Rembrandt (Earl of Denbigh's Collection); 'The Listening Girl' (Buckingham Palace). Numerous other examples exist in the galleries of Berlin, Brussels, Munich, The Hague, Frankfort, Hanover and Petrograd.

MAESTRICHT, mās'trĭht, Netherlands, the capital of the province of Limburg, on the left bank of the Maas, at the confluence of the Geer, lies on the Belgian frontier, 19 miles north-northeast of Liége, 56 miles east of Brussels and 52 miles west by south of Cologne. Among the chief buildings are the church of Saint Servais, partly Romanesque and partly Gothic, dating from the 10th century, the townhall, the courts and general prison and the arsenal. The fortifications were dismantled between 1871 and 1878; it it, however, still a considerable garrison town. Maestricht carries on an active transit trade with Belgium, and has manufactures of glass and earthenware, firearms, shot, cloth and paper-hangings; also ironfoundries, beet-root sugar refineries, tobacco and cigar factories, tan-pits, distilleries and breweries, the latter producing very noted beer. About three miles from the town is the Pietersberg (Peters Hill), on which stands the fort of Saint Pierre, and under which are extensive subterranean quarries of extraordinary interest, the excavation of which is supposed to have been begun by the Romans. Maestricht was besieged and taken and 8,000 of its inhabitants were massacred in 1579 by the Spaniards under the Duke of Parma; in 1673 it was taken by Louis XIV, and again by the French in 1748 and 1794. William III of England failed to capture it and in 1830 its garrison resisted successfully the attacks of insurgent Belgians. Pop. 38,611.

MAESTRICHT BEDS, in geology, a series of calcareous beds 100 feet thick, on the banks of the Meuse, near the Dutch city of Maestricht. The Maestricht calcareous rock contains *Belemnitella, mucronata, Pecten quadricostatus,* etc., also the genera *Braculites, Hamites,* etc., which are only Mesozoic. It is a connecting link between the Secondary and the Tertiary rocks, but in all essential respects belongs to the former.

MAETERLINCK, mĕt'ĕr-lĭnk, **Maurice** (Gallicized from the original MOORIS MÄTERLINCK), Belgian author: b. Ghent, 29 Aug. 1862. He was educated in a Jesuit school in Belgium, then studied law, was admitted to the bar in 1887, but was from the first more interested in letters, and in 1896 settled in Paris as an author. His work may be divided into three parts,—his lyric verse, his dramas and his philosophical essays. Of the first the two volumes 'Serres Chaudes' (1889) and 'Douze Chansons' (1896) are representative. Maeterlinck's verse is imaginative, but lacks in any strong degree the melodic quality. His dramas are 'La Princesse Maleine' (1889); 'Les Aveugles' (1890); 'L'Intruse' (1890); 'Les Sept Princesses' (1891); 'Pélleas et Mélisande' (1892); 'Alladine et Palamides' (1894); 'La Mort de Tintagilles' (1894); Aglavaine et Sélysette' (1896); 'Ariadne et Barbeblue' (1899); 'Sœur Béatrice' (1899); and 'Monna Vanna' (1902); 'Jayzelle' (1903); 'The Blue Bird,' a sublimated Fairy Tale (1909); 'Mary Magdalene' (1910); 'The Death of Tintagiles' (1913). Several of these were translated into English by Richard Hovey (q.v.), and 'Monna Vanna' was rendered by Alexis I. du P. Coleman. The dramas are Maeterlinck's most striking work. Their eery symbolism can hardly be explained, but must be appreciated at first hand. Though they inaugurated a new theatric school — the 'Drame Intime'— they are properly reading plays, and lose their subtlety, mystic qualities and impressiveness in presentation. 'Pélleas et Mélisande was given in the United States by Mrs. Patrick Campbell. To many the essays are his ultimate test as a force in literature, the most interesting things that Maeterlinck has done. The volumes are 'Le Trésor des Humbles' (1896); 'La Sagesse et la Destinée' (1898), and 'La Vie des Abeilles' (1902); 'Le double jardin' (1904); 'Mon chien' (1906); 'L'Intelligence des Fleurs' (1907); 'La Mort' (1913); 'The Unknown Guest' (1914). The first is somewhat mystical, all are somewhat diffuse; but he has been called by virtue of them a true successor of Swedenborg and Böhme. See BLUE BIRD, THE; MONNA VANNA; PELLEAS AND MÉLISANDE Consult Courtnev, 'Development of Maurice Maeterlinck' (1904); Harry, 'Maurice Maeterlinck; a Biographical Study' (1910); Thomas, 'Maurice Maeterlinck' (1911); Sturgis, 'The Philosophy of Maeterlinck' (1914); Clark, 'Maurice Maeterlinck: Poet and Philosopher' (1915); 'The Wrack of the Storm' (1916).

MAEVIAD AND BAVIAD. See BAVIAD.

MAFEKING, mä-fä-king' or măf'ĕ-king, Cape Colony, a former Bechuana settlement, now a town, the administrative seat of the

Bechuanaland protectorate, close to the borders of the Transvaal, 870 miles by rail northeast of Cape Town and about 200 miles west-southwest of Pretoria. The town stands near the upper Malopo River, is 4,194 feet above sea-level and contains several substantial buildings, including a Masonic temple, a town-hall and a hospital and there is a good water-supply and a race-course. Mafeking sustained a protracted siege during the South African War of 1899–1901. It was isolated in October of the former year and was brilliantly defended by a small force under Colonel (now General) Baden-Powell, until relieved by Colonel Mahon in May 1900.

MAFFEI, Francesco Scipione, MARCHESE DI, Italian dramatist and scientist: b. Verona, 1 June 1675; d. there, 11 Feb. 1755. He studied at the Jesuit College, Parma, for five years and from 1698 at Rome. He was present at the battle of Höchstädt in 1704, taking part in the Bavarian campaign as a volunteer under his brother, Gen. Alessandro Maffei. He commenced a literary career in 1710 by the publication of 'Della scienza cavalleresca,' noted for a censure of duelling; became associated in founding the *Giornale dei litterati;* and edited with introductions some of the best plays of the Cinque cento. In 1713 appeared his own play 'Merope,' since frequently reprinted, one of the most brilliant successes achieved in the history of dramatic literature. While it lacks a love motif, it is considered a masterpiece of Italian tragedy. Voltaire adapted it for the French stage, declaring it "worthy of the most glorious days of Athens," and it inspired Home's celebrated English drama 'Douglas.' His versatility and scientific attainments are shown in subsequent work which include 'Teatro italiana' (1723–25); 'Istoria diplomatica' (Mantua 1727); 'Le Ceremonie' a comedy (1728); and 'Verona illustrata' (1732). From 1732 he spent four years in travel in France and England, returning by way of Holland and Germany, and wrote 'Galliæ Antiquitates' (Paris 1733); 'Istoria teologica' (Trent 1742); 'Dell impiego del denaro' (1746), justifying loans on interest; and 'Arte magica' (1749–54). He was also associated with Maratori in the great collection of the 'Rerum italicarum scriptores' which occupied 15 years and were published in 25 folio volumes (1723–38). A complete edition of Maffei's works were published in 21 volumes (Venice 1790); and selected 'Opusculi litterari' (Venice 1829; Milan 1844). See MEROPE.

MAFFITT, John Newland, American clergyman: b. Dublin, Ireland, 28 Dec. 1794; d. Mobile, Ala., 28 May 1850. He was a Wesleyan preacher in Ireland and in 1819 emigrated to the United States, where he became a member of the New England Methodist Episcopal conference. He founded the 'Western Methodist' in Nashville in 1833 and conducted revivalist meetings throughout the South and West. In 1837 he became professor of elocution and *belles-lettres* at La Grange College, Louisiana, and in 1841 he was elected chaplain to Congress. He published several religious works, also an autobiography.

MAFFITT, John Newland, American naval officer: b. at sea, 1819; d. Wilmington, N. C., 1866. He enlisted in the United States navy in 1832 and in 1861 entered the service of the Confederacy where he took rank as commodore. In command of the *Florida* he rendered himself valuable to the Confederate cause, taking many prizes and damaging seriously United States commerce. Owing to ill-health he resigned before the end of the war.

MAFIA, mä-fē'ä, a Sicilian secret society similar to the Camorra (q.v.), which has long existed in Naples, but much more powerful. The Mafia is essentially a form of organized lawlessness, but its organization is sufficiently elastic to baffle all the attempts of the government to suppress it. It is generally said to have had its origin in the *compagni d'armi,* a kind of police organized in Sicily early in the 19th century and dissolved by Garibaldi in 1860. Its members, who are required to prove their daring in a knife duel, are bound never to carry their suits to the regular courts or to give evidence before them. Murder and robbery are discountenanced under ordinary circumstances, but they are resorted to without hesitation in the case of informers or specially obnoxious persons. Blackmail is levied from landowners, who are required to employ only *mafiosi* in certain occupations. Criminals are protected and elections controlled by this infamous society, whose authority is greater than that of the law among the lower classes in Sicily. The Chinese highbinder societies are similar to the Mafia. Within recent years these murderous organizations have secured a footing in the United States and murders directly chargeable to the Mafia have been committed in New York, New Orleans, Chicago and other large cities. Consult Alongi, G., 'La Mafia' (Turin 1886; 2d ed., Palermo 1904); Calou, E. C., 'La Mafia' (Madrid 1905); Paton, W. A., 'Picturesque Sicily' (1898); Vizzini, A., 'La Mafia' (Rome 1880).

MAGALHAES, mą-gą-lyä'ensh, **Domingos José Gonçalves** DE, VISCONDE DE ARAGUAYA, Brazilian poet and diplomat: b. Rio de Janiero, 13 Aug. 1811; d. Rome, Italy, 10 July 1882. He was educated in medicine; but entered upon a diplomatic career in 1836, when he became an attaché at the Brazilian embassy at Paris. He was Minister to Austria in 1859–67, and Ambassador to the United States in 1867–71. At the time of his death he was Ambassador at Rome. He began the writing of verse at an early age and attained a considerable reputation, being regarded as the leader of the romantic school of Brazilian poetry. Among his more important works are 'Suspiros poeticas' (1836); and 'A confederação dos Tamoyos' (1857). His 'Obras completas' were published (Paris 1864).

MAGALHÃES, Fernão de. See MAGELLAN, FERDINAND.

MAGALLANES, mä-gäl-yä'nes, Chile, a territory lying south of the department of Chiloe, and including the many islands, large and small, along the western and southern coasts of Chile. Its entire area is about 65,355 square miles. Among the more prominent islands in the territory are the Wellington group, Hanover group, Queen Adelaide Archipelago, Madre de Dios and a part of Tierra del Fuego. The mainland is a narrow strip of mountainous sea-coast. The islands are barren; there are extensive forests on the mainland, but very little agricultural land. The climate

is disagreeable and stormy. The animal life is not abundant; the seal and sea-otter frequent the coast and in the sheltered regions east of the Andes cattle, horses and sheep are raised. Coal has been found in the southern part and there are also copper and gold mines. The capital is Punta Arenas. Pop. 30,623.

MAGDA. Sudermann's 'Heimat' ("Home") was the sensation of the theatrical season 1889–90 in Berlin, and the play, either in the original German or in translations commonly bearing the title 'Magda'— the name of the heroine — is probably to be regarded as the most widely known and the most successful drama of the end of the century. Its success is traceable to at least four causes: its theme of revolt against paternal tyranny is one to which the times were sympathetic, its construction is skilful and in every sense theatrical, it contains a number of picturesque episodes and amusing characters, and is distinguished for animated dialogue; but most of all, its heroine is an unconventional, self-assertive, and emotional "new woman" who affords an actress an unusual opportunity for temperamental display. The technique is a clever combination of the naturalism of Ibsen and the methods of the *drame à thèse* familiar in the works of Dumas *fils*. The conventional *raisonneur* — in the person of the Pastor Heffterdingk — mediates between Magda and her father, and debates with each the problems presented by the situation of a prodigal daughter who returns home after a life of moral irregularity but operatic success. We are bidden to despise respectability and admire independence. But the representative of each side is far from being an acceptable champion. Magda's father fails to recognize the difference between a child with duties and a human being with rights, and Magda reveals no conception of the fact that duty is only in part a social obligation and is in its innermost essence an obligation of self-respect. Translated by C. E. A. Winslow (Boston 1896); edited by F. G. G. Schmidt (Boston 1909).

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MAGDALA, măg'dą-lą, or **MAKDALA,** Abyssinia, fortified town on the plateau of Talanto in Shoa, 72 miles northeast of Debra Tabor. The original fort was built on an isolated rock 3,300 feet above the Beshilo, and was stormed and wholly destroyed by the British troops under Sir Robert Napier 13 April 1868, Sir Robert becoming Baron Napier of Magdala in recognition of the achievement. The natural strategic advantages of the position, however, caused the fort to be rebuilt and the town has acquired considerable importance. Altitude, 9,110 feet. Pop. about 4,000.

MAGDALEN, măg'dą-lĕn, a name applied to one of the Marys in the Gospels, derived from her place of birth, or former residence, in order to distinguish her from other women of that name (Matt. xxvii, 56, 61; Mark xv, 40, 47; Luke viii, 2; John xix, 25).

MAGDALEN (môd'lĭn) **COLLEGE,** Oxford, England, originated in Magdalen Hall, founded in 1448 by William Patten, commonly called William of Waynflete, from the place of his birth, bishop of Winchester and Lord High-chancellor of England, who 10 years later added the College of Saint Mary Magdalen. In some respects Magdalen is the most noteworthy college of the university. Five of the fellowships are attached to five Waynflete professorships, of moral philosophy, chemistry, mineralogy, physiology and pure mathematics, established in lieu of the three former lectureships of divinity, moral philosophy and natural philosophy. There is also a professorship of botany. The buildings are noted for their beauty and occupy extensive grounds. Among Magdalen's celebrated alumni are Addison, Camden, Foxe, Gibbon, Hampden, John Lyly, Sacheverell, Selborne, Tyndale and Cardinal Wolsey. Consult Wilson, 'Magdalen College' (1899); Glasgow, 'Sketches of Magdalen College' (1901).

MAGDALEN (măg'dą-lĕn) **ISLANDS,** Quebec, Canada, near the centre of the Gulf of Saint Lawrence, 54 miles northwest of Cape Breton, Nova Scotia, and 100 miles southwest of Newfoundland. Amherst, Alright, Coffin, Wolf, Grindstone, Deadman, Entry and Byron islands compose the group which are politically attached to the district of Gaspé, Quebec. The inhabitants exist chiefly by the fisheries of the adjacent waters; gypsum which is found in veins and hollows, and grindstones from Grindstone Island, are exported. House Harbor on Alright Island, and Amherst where there is a custom house, are the chief settlements. Pop. about 5,000.

MAGDALENA, măg-dā-lā'nā, a river of Colombia, South America, which has its rise in the Andes Mountains in the southwestern part of Colombia, and flows north to the Caribbean Sea. A short distance from the sea, at the city of Barranquilla, the river divides and discharges its waters through two channels. It is about 1,000 miles in length. It is navigable for ocean steamers to La Dorada, 592 miles from Barranquilla, and for small steamers to about 900 miles from its mouth. Magdalena River is the principal route from the sea to the interior of the country, and the work of clearing and canalizing both the upper and lower parts of the stream has greatly increased its importance and value as a means of communication and transportation. Bogota (q.v.), the capital, is largely dependent upon this river for means of communication with places on the coast. The largest tributary is Cauca, whose source is near that of the Magdalena, and part of its course is almost parallel with the main river. Short railroads connect some of the interior towns with the river and its tributaries.

MAGDALENA (măg-dą-lē'ną) **BAY,** an inlet on the west coast of Lower California, in Mexico, one of the best harbors on the Pacific Coast. The inlet or arm of the sea is about 40 miles long and 12 miles wide and is protected by a long, low sand-bar. A town of the same name is situated on the harbor.

MAGDALENE (măg'dą-lĕn) **COLLEGE,** Cambridge, England, was founded in 1542 by Thomas, Baron Audley of Walden, in place of Buckingham College, established by Edward, Duke of Buckingham, in 1519, which had succeeded a monks' hostel for students founded in 1428. There are seven open fellowships on the foundation, and 12 open scholarships. There

are also several exhibitions. The annual Pepysian benefaction, value £50, is in the master's gift, and is usually bestowed upon poor and deserving students. The buildings consist of two courts, restored and altered in 1880, a chapel and hall dating from the 15th century and the Pepysian Library, built in 1688. Samuel Pepys, Charles Kingsley and Charles Stewart Parnell were educated at Magdalene College.

MAGDALENIAN STAGE, a period in the history of Paleolithic man in southwestern Europe when humanity lived largely in caves (wherefore these people are called "cave men"). They had attained a remarkably high degree of skill in the graphic arts, and adorned the interior of caverns with paintings and many objects with engravings of animals and other subjects. See STONE AGE.

MAGDEBURG, mäg'dĕ-boorg, Germany, city, capital of the Prussian province of Saxony, on the Elbe, about 88 miles southwest of Berlin. The manufacturing and trade of Magdeburg are extensive, and its facilities for transportation by water and railroad are excellent. Among its industrial establishments are the Gruson Works, noted for their connection with the Krupp Works, the beet-sugar factories and a number of other establishments. It has a large number of excellent schools, gymnasia, a pedagogical seminary, art schools, industrial schools, etc. Magdeburg is a place of great antiquity, being a trading centre in the 9th century. It early distinguished itself in the Reformation. During the Thirty Years' War the town was besieged, stormed and sacked by Tilly, when 20,000 persons are said to have been murdered. Pop. about 279,685. Consult Wolter, 'Geschichte der Stadt Magdeburg' (3d ed., Magdeburg 1901); Dodge, 'Gustavus Adolphus' (New York 1906).

MAGDEBURG CENTURIES, a Protestant history of the Christian Church by centuries, written in Latin in 1562 by Matthias Flacius of Magdeburg and other Lutheran theologians. It first appeared as 'Historia ecclesiæ Christi' (7 vols., Basel 1559–74); a German translation of the earlier part also appearing (Jena 1560–65). German Protestant princes bore the cost of publication. The 'Ecclesiastical Annals' of Baronius (q.v.) were a Catholic reply to the Magdeburg Centuries. See PROTESTANTISM.

MAGDEBURG HEMISPHERES, a celebrated invention of two hollow hemispheres, made of copper or brass, with their edges accurately fitted to each other, and one of them furnished with a stopcock. When the edges are rubbed over with grease, pressed tightly together and the globe thus formed exhausted of air through the cock, the hemispheres, which fell asunder before exhaustion, are now pressed together with immense force. If they are one foot in diameter they will, after exhaustion, be pressed together with a force of nearly a ton. This experiment was first performed by Otto von Guericke of Magdeburg, in 1654, at the imperial Diet at Ratisbon, to the astonishment of the Emperor Ferdinand III and the royal family.

MAGELLAN, ma-jĕl'an, **Ferdinand** (Port. FERNÃO DE MAGALHÃES; Sp. FERNANDO MAGALLANES), Portuguese navigator: b. probably at Villa de Sabroza, Trazos-Montes, about 1480; d. Philippine Islands, 27 April 1521. He served in the Indies with distinction, especially at Malacca, and in 1514 saw service in Morocco. In resentment at his treatment by the king, who had not, he thought, duly rewarded his services, he, with Ruy Falero, a geographer and astronomer, renounced his nationality and offered his services to Spain. Magellan's proposal to seek a western route to the Moluccas was accepted by Charles V, and on 20 Sept. 1519 he set sail from San Lucar de Barrameda in command of five vessels. He passed through the strait which bears his name (see MAGELLAN, STRAIT OF), and on 28 Nov. 1520, reached the great ocean which he called the Pacific from its calmness. With his three remaining vessels he sailed by way of the Ladrones Islands to the Philippines, discovering Samar on 16 March 1521. He caused the king of Zebu to swear allegiance to Spain, but was killed in a fight with the natives of Matan. His vessel, the *Victoria,* under Sebastian del Cano, completed this, the first circumnavigation of the globe. The chief authority for the voyage is a work by Pigafetta, an Italian who accompanied Magellan. Consult Lord Stanley, 'The First Voyage Round the World' (1875); and Guillemard, 'Ferdinand Magellan' (1891).

MAGELLAN, Strait of, the channel which separates the continent of South America from Tierra del Fuego and thus forms a communication between the south Atlantic and the south Pacific oceans. It is upward of 360 miles long and is of difficult navigation. Its breadth varies exceedingly, the maximum being somewhat over 70 miles. There are a number of bays along the shore and at the southwestern end a group of several small islands. Punta Arenas is the best harbor. The strait was discovered in 1520 by Fernão de Magalhães or Magellan.

MAGELLANIC CLOUDS, *in astronomy,* called the Nubeculæ, Major and Minor, from their cloud-like appearance, two oval masses of light in the southern hemisphere near the pole; often both visible to the naked eye. Sir J. Herschel describes them as consisting of swarms of stars, clusters and nebulæ of every description.

MAGENDIE, François, frăn-swă mă-zhŏn-dē, French physician and physiologist: b. Bordeaux, 15 Oct. 1783; d. Paris, 8 Oct. 1855. He was the pupil of the celebrated surgeon, Boyer, and at 20 was appointed successively *aide d'anatomie* in the faculty of medicine, and demonstrator. He, however, subsequently devoted himself principally to the practice of medicine, was in 1819 elected a member of the Academy of Sciences and in 1831 succeeded Récamier in the chair of anatomy in the College of France, which he retained until his death. As an experimenter in physiology he occupied a high position and his experiments on living animals were at one time so numerous and involved so much suffering to the animals that the French government deemed it necessary to interfere. The results obtained, however, were of great importance, if they do not absolve him from the charge of cruelty. Among them may be named an original demonstration that the two roots of the spinal nerves are devoted to two separate functions; that the veins are organs of absorption; that strychnine acts upon the

LAKE MAGGIORE

spinal cord and contracts by tetanic spasm the nerves of respiration, thus inducing asphixia; that food destitute of nitrogen is not nutritious, and that prussic acid is a valuable remedy in certain forms of cough arising from irritation in the lungs. He was a prolific author of medical works, the most important of which are 'Formulaire pour la préparation et emploi de plusieurs nouveaux médicaments' (1821), containing an account of the effects of certain plants then recently introduced into the materia medica, and which has been translated into all the languages of Europe; 'Précis élémentaire de physiologie' (1816–17), for many years an important manual for students; 'Leçons sur les phénomènes physiques de la vie' (1836–42); 'Leçons sur les fonctions et les maladies du système nerveux' (1839); 'Leçons sur le Sang' (1839); 'Recherches philosophiques et cliniques sur le liquide cephalorachidien ou cérébro-spinal' (1842).

MAGENTA, mä-jĕn'tä, Italy, town in the province of Milan, 16 miles west of Milan, is situated in a grape region, in which the cultivation of grapes and mulberries and the manufacture of wine are the principal industries. Considerable raw silk is exported. It was the scene of a famous engagement 4 June 1859 between the French and Sardinian forces and the Austrians. The Austrians were defeated, largely through the superior tactics of General MacMahon of the French army. Pop. about 10,137.

MAGENTA, or **ANILINE RED,** a coal-tar dye, which consists of a mixture of the hydrochlorides of rosaniline and para-rosaniline. (See ROSANILINE). It may be prepared from aniline oil by digesting the aniline with arsenic acid or with nitrobenzene and ferrous chloride. When the oxidation is complete the rosaniline hydrochloride is precipitated by the addition of common salt in large excess, the hydrochloride being formed by double decomposition and thrown down because it is but sparingly soluble in salt solutions. Consult Benedikt, 'Chemistry of the Coal-Tar Colors.'

MAGGIORE, mäd'jō'rĕ, **Lake,** one of the largest lakes in Italy, the *Lacus Verbanus* of the Romans, is situated for the most part in Italy, but also partly in the Swiss canton of Ticino. It is 39 miles in length and varies in breadth from one-half mile to five and one-half miles. It is 646 feet above the level of the sea and has a maximum depth of 1,158 feet. The river Ticino flows through it. In the southwestern expansion of the lake are the Borromean Isles (q.v.). On the north and west it is surrounded by granitic mountains, 7,000 feet high, on the south and east by vineyard-covered hills. On its shore are a large number of villages and cities noted for beautiful scenery and historic connections.

MAGGOT, the larva of a fly. (See FLIES).

MAGI, mā'jī (Lat. *Magus,* Gr. *Μαγος*), an Accadian term recently brought to light by Assyrian scholars; Accadian being the language of the people of Babylon and Media. The word signifies "august," "reverend," and was the title of their learned and priestly caste. The Semitic nations afterward dominant in Babylonia and Assyria adopted the learning and many of the religious observances of the early inhabitants, as also the name for the learned caste; and out of the Semitic form the Greeks made *magos.* Under the Persian Empire the magi were not only the "keepers of the sacred things, the learned of the people, the philosophers and servants of God," but also diviners and mantics, augurs and astrologers. They were held in the highest reverence, and no transaction of importance took place without or against their advice. Hence their almost unbounded influence in both private and public life. Apart from the education of the young princes being in their hands, they were the constant companions of the ruling monarch. Zoroaster, in the course of his great religious reform, reorganized the body of the magi, chiefly by reinforcing the ancient laws as to their manner and mode of life, which was to be one of the simplest and severest, befitting their sacred station, but which had become one of luxury and indolence, and by reinstituting the original distinction of the three classes of *herbeds* ("disciples"), *mobeds* ("masters") and *destur mobeds* ("complete masters"). The food, especially of the lower class, was to consist only of flour and vegetables; they wore white garments, slept on the ground and were altogether subjected to the most rigorous discipline. The initiation consisted of the most awful and mysterious ceremonies, and was preceded by purification of several months' duration. As far as we can learn the principle of good and evil, as represented by Ormazd and Ahriman, was recognized, and belief in the coming of a savior, in the resurrection and in a future life was held. Gradually, however, their influence, which was all-powerful during the epoch of the Sassanian kings of Persia, began to wane, and, from being the highest caste, they fell to the rank of wandering jugglers, fortune-tellers and quacks, and gave their name to sleight-of-hand and conjuring tricks. But the name seems to have been also current as a generic term for astrologers in the East, as is evidenced by the New Testament narrative of the homage of the Magi to the Infant Christ. According to the narrative (Matt. ii, 1–12) the three wise men came from the East to Jerusalem, led by a star, which at length guided them safely to the place of the Nativity at Bethlehem, where they offered their gifts of gold, frankincense and myrrh. As the "Three Kings" their names became celebrated in the Middle Ages, and Bede distinguishes them as Kaspar, Melchior and Balthasar. (See also PARSEES; ZOROASTER). Consult Cumont, F. V. M., 'Oriental Religions in Roman Paganism' (Chicago 1911); id., 'Les mystères de Mithra' (3d ed., Brussels 1913); Moulton, J. H., 'Early Zoroastrianism' (London 1913).

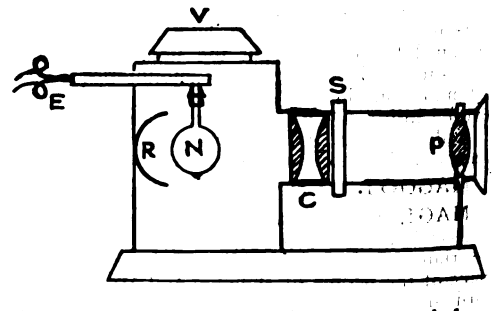
MAGIC, or **BLACK ART,** was formerly the means of producing supernatural effects with the assistance of evil spirits. Doubtless in very remote time magic and religion were practically one, but the development of mentality brought about a differentiation. The fundamental fact was a strong belief in what was considered supernatural. Magic is of a more positive nature, but it carries with it the idea of taboo (q.v.). Supernatural effects were at an early period naturally associated with the exercise of the healing art. In the rudest stage of society this was confined to the women, and naturally arrived at the dignity of a profession in the hands of the older, whom

experience had gifted with superior skill. As their art was for the most part a mystery to themselves, they gradually came to be regarded as objects of fear as much as of hope, and magic medicines became synonymous with poison. The sorceress, poisoner and witch were in time reckoned identical. (See WITCHCRAFT). Mediea, Persia and the neighboring countries, famous for their knowledge of astronomy and astrology, are described as the chief seats of the ancient Magi, whose doctrine seems to be, in part, of great antiquity. This doctrine represented opposition or strife as the parent and original cause of all things. After the opposition between light and darkness, Ormuzd and Ahriman, was established, the whole series of finite beings, the whole sensual world, proceeded from this constant struggle of light and darkness, good and evil. The change of day and night, light and darkness, the whole series of ages, time itself, is only a consequence of this struggle, in which sometimes light, sometimes darkness, appears victorious, until finally light shall conquer for ever. If all finite things stand under the influence of preserving and destroying powers in nature, it is clear that he who could master these powers could dispose at his pleasure of the things subject to them; and the doctrine of the Magians was that by prayer and a true knowledge of those laws of opposition, love and hatred, light and darkness, such power could be obtained; and that thus also it was possible to pry into futurity. But it was believed that as the world became sinful the light of the ancient doctrine of the Magi was obscured, and those who bore the name became at last only evil-disposed sorcerers. One important branch of their art was now the excitement of love by potions and enchantments. Their love-potions consisted partly of ingredients which are still known to the physicians as stimulants, partly of parts of animals who had died longing for food or air, or the saliva of hungry dogs, and other still more disgusting substances. Magic at this period also occupied itself with fortune-telling, calling up the dead and bewitching by the look — a superstition which we find existing in the processes against witches in modern times. It can hardly be doubted that the art of the ancient magicians was founded to a considerable degree upon a knowledge of the powers of nature superior to that of the general public. At one time magic was greatly studied in Europe, and many distinguished names are found among its students and professors. The most famous of these are Albertus Magnus, Roger Bacon, Cornelius Agrippa, Michael Nostradamus, John Dee, William Lilly, etc. While magic is a thing of the past there are still many survivals to be found to-day among the superstitions held by a large number of individuals. Consult Constant, A. L., 'History of Magic' (trans. by Waite, Philadelphia 1914); Ennemoser, 'History of Magic'; Lang, A., 'Magic and Religion' (New York 1901); Scott, 'Demonology and Witchcraft'; Mackay, 'Memoirs of Extraordinary Popular Delusions'; Regnault, 'La Sorcellerie, ses Rapports avec les Sciences biologiques' (1897); Lehmann, 'Aberglaube und Zauberei' (1898).

MAGIC CIRCLE. See CIRCLE, MAGIC.

MAGIC LANTERN, an optical instrument for the projecting of enlarged images upon a screen or other adapted surface. This title is commonly given to the type of instrument employed for home amusement, the more elaborate types used for public exhibition and educational work being known as stereopticons or optical lanterns (q.v.). In its simplest form the instrument consists of a lantern, generally of tin, and cubical in form, having in the interior a powerful Argand lamp, the pencils of light issuing from which pass through a convex lens to a screen or a white wall a few feet away. It is most commonly used as a toy. The principle of its construction is very simple. A lamp is placed within the closed lantern with its burner in the focus of a concave parabolic mirror, the reflected light from which passes through a horizontal tube on a level with the flame. This tube contains two lenses, the one a hemispherical illuminating lens, of short focus, to condense a strong light on the picture, and the other a double convex lens, which receives the rays after they have passed through the picture, and throws them on the screen. The picture, known as the lantern slide, is inserted through a transverse slit into the tube between the lenses. The screen must not be too far removed from the lantern, otherwise the image will become indistinct and distorted. The tube is made to slide in and out, so that the distance of the lens from the slide being capable of being increased or diminished, an image of any moderate size, larger or smaller, may be focused after the desired size is secured by increasing or diminishing the distance between the lantern and the screen.

Where an electric lighting current is available the pictures may be much improved in illumination by the use of a 60-watt Mazda lamp in place of the Argand lamp (which is often dangerous from overheating if run too long without cooling down). A still more brilliant illumination may be had with the nitrogen lamp. Further improvement may be secured by using a regular condenser, formed of two plano-convex lenses of four or five inches diameter, set with the convex sides toward each other and quite close together. Far better results as to sharpness and clearness on the screen will be secured by the use of a lens of the standard «portrait» type as the projector. For a small house picture, say from six to nine feet in diameter, the lens known as «quarter-size» will give very satisfactory results. The accompanying diagram represents conventionally a longitudinal section through a magic lantern fitted with a nitrogen lamp (N), attached to the house lighting wires (E), and provided with a pair of plano-convex condensing lenses (C). The reflector is indicated at R; the slot in which the slides are inserted at S; the double-



convex projecting lens at P; and the ventilating chimney, to carry off excessive heat, at V.

The objects exhibited with the magic lantern are usually pictures drawn, painted or photographed on glass strips or plates of appropriate size, the light passing through them from the condenser and thence through the projecting lens. The size of the image upon the screen depends chiefly upon the brilliancy of the light, and hence the circle which it is capable of illuminating. Secondarily the size will depend upon the distance of the lantern from the screen, and the ability to focus the image thereon. These three conditions must be skilfully adjusted to secure the best results. See STEREOPTICON.

Bibliography.— Elmendorf, D. L., 'Lantern Slides: How to Make and Color Them' (New York 1900); Fraprie, F. R., 'How to Make Lantern Slides' (Boston 1918); Gage, S. H. and Gage, H. P., 'Optical Projection: The Principles, Installation and Use of the Magic Lantern' (Ithaca, N. Y., 1914); Williams, Brown and Earle, 'The Magic Lantern in College Work' (Philadelphia 1908).

MAGIC MIRROR OF JAPAN, some few specimens of the small, round bronze mirrors made in Japan which differ from others by reflecting upon a white screen the raised figures on the back of the mirror when a strong beam of light is thrown upon the polished convex surface. The mirrors are made of bronze with a polished, slightly convex face and the backs are decorated with raised ornaments. The characteristics of the magic mirrors was long a mystery, as much to the makers as to others, the peculiarity being apparently accidental. The Japanese themselves, while possessing a reverence for all mirrors, placed no undue value upon the magic mirrors. The Chinese noticed the phenomenon as early as the 11th century and gladly paid fabulous prices for such as possessed the trait. The physical nature of the mystery was first revealed by the French physicist, Charles Cléophas Person, in 1847. He observed that the convex surface of the magic mirrors was not uniform, the portions in front of the ornamental figures being plane, and therefore reflecting direct rays while the convex portions gave divergent rays and so made the reflection of the images indistinct. The theory was worked out by W. E. Ayrton and J. Perry, who discovered the phenomenon to be due to peculiarities in the composition of the metal in some of the mirrors, the pressure used in polishing the thicker portions containing the raised ornaments resulting in a difference on the reflecting surface too minute to affect the reflection under ordinary light, but plainly apparent when thrown on a screen by a bright light. Consult 'Proceedings of the Royal Society of London' (Vol. XXVIII, 1878).

MAGIC SKIN, The, or **'WILD ASS' SKIN,'** as the French title 'Peau de chagrin' is also translated, is one of the most famous of the novels making up the imposing series of the 'Human Comedy' of Balzac, where it may be found in the group of 'Philosophical Studies.' It was also one of the earliest (1831). While it offers abundantly that penetrating observation of human conduct and character, and that minute record of the myriad little concrete details of circumstance and environment that condition and explain them, that mark the realism of Balzac and make his work so full of what Taine has called "human documents," it is essentially an allegory and enforces, under the form of a magic symbol, a profoundly moral truth. The magic skin is a piece of shagreen bearing this inscription: "Possessing me thou shalt possess all things, but thy life is mine, for God hath so willed it. Wish and thy wishes shall be fulfilled; but measure thy desires, according to the life that is in thee. This is thy life, with each wish I must shrink even as thy own days. Wilt thou have me? Take me. God will hearken unto thee. So be it." The young man who becomes the possessor of this talisman in a moment of suicidal desperation demands of it a princely fortune, and sees himself with the power to have every wish gratified. But with each exercise of his power he observes with horror that the magic skin shrinks and shrinks; and less and less do his demands on its power bring with them satisfaction. The story is not of even interest throughout, and the narrative of the youth of the hero, which takes up a half of the book, may seem somewhat long drawn out. But it is one of the best examples of Balzac's peculiar power of seeing facts and illuminating them with ideas. There are English translations by Ellen Marriage, with a preface by George Saintsbury (Philadelphia 1897), and by Katherine P. Wormeley (Boston 1896).

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MAGIC SQUARES. A magic square is a square divided into equal smaller squares, each containing a term of a series of integers, the sums of the numbers in any horizontal, vertical and diagonal line being the same.

A

3	4	1	5	2
2	3	4	1	5
5	2	3	4	1
1	5	2	3	4
4	1	5	2	3

B

15	0	20	5	10
0	20	5	10	15
20	5	10	15	0
5	10	15	0	20
10	15	0	20	5

C

18	4	21	10	12
2	23	9	11	20
25	7	13	19	1
6	15	17	3	24
14	16	15	22	8

The construction of such squares is an amusement of great antiquity. They were known in India and China before the Christian Era, and a knowledge of them was introduced into Europe by Moschopulus who flourished in

Constantinople early in the 15th century. Talismanic virtues and occult properties were ascribed to them by the ancients. They were engraved on metal and stone and worn as amulets, as in India at the present day. A magic square of the fourth order is engraved on the gate of the fort at Gwalior in that country. Mediæval astrologers and physicians were filled with superstitions in regard to magic squares. They associated the squares of the orders 3, 4, 5, 6, 7, 8 and 9 with the astrological planets Saturn, Jupiter, Mars, the Sun, Venus, Mercury and the Moon. A square containing one cell symbolized the unity of the Deity; one of the second order, not being possible, signified the imperfection of the elements air, earth, fire and water. Albert Dürer's well-known painting, 'Melancholy,' contains a magic square of the fourth order, doubtless because of its supposed mystical significance. They have been made the subject of elaborate research by various investigators but the world is indebted chiefly to the French mathematicians for the development of the theory of magic squares.

In this article general rules for the construction of magic squares of any order will be given, illustrated by particular examples. The squares produced by these methods by no means exhaust all possible arrangements, but the rules furnish squares in great number and variety.

Magic squares are divided into two general classes according as the numbers of cells on a side is odd or even. Even squares are subdivided into doubly even, i.e., when the root is divisible by 4, and singly even, when the root is divisible by 2 but not by 4. A horizontal line of cells is called a row, and a vertical line a column. Two cells in a row equidistant from the ends are termed a *horizontal pair*, and two cells in a column equidistant from the ends are termed a *vertical pair*. In a series of natural numbers any two equidistant from the ends are said to be complementary.

Magic Squares of an Odd Order.—La Hire's method for constructing odd magic squares requires the formation of two auxiliary squares A and B. For a square of the fifth order diagram A is formed with the series of natural numbers 1, 2, 3, 4 and 5 as follows: First, put 3 (the mean of the numbers) in the top left-hand corner cell, and the numbers 1, 2, 4 and 5 in the cells of the top row in any order. Next, the number in each cell of the top row is repeated in the cells of a diagonal sloping downward to the right. The cells filled by the same number form a *broken diagonal*. Form a new square by making the left-hand column of A (beginning with its bottom number) the first row in the new square, and so on. Next, instead of the numbers 1, 2, 3, 4 and 5, substitute respectively the numbers 0, 5, 10, 15 and 20, thus producing square B. In each cell of square C place the sum of the numbers in similarly situated cells of squares A and B. The result is a magic square of the fifth order. Any magic square of an odd order can be constructed in a similar manner.

La Loubère's Method.—In order to construct a magic square of an odd order by this method, place 1 in the middle cell of the upper row, and using the series of natural numbers (any arithmetical series will answer) proceed always diagonally upward to the right, except when the edge of the square or a cell already filled is reached. When a number would fall outside the square, carry it to the extreme cell in that row or column in which the cell outside would fall. When a cell is reached that is already filled or when the righthand upper corner cell is reached, place the number in the cell just below. The magic square D is formed by this rule. It may be remarked here that from any magic square, whether odd or even, a number of other magic squares can be formed by the mere interchange of the row and column which intersect in a diagonal with the row and column which intersect in some other cell in the same diagonal. In this way from each magic square of the fifth order 48 other magic squares can be formed.

D

30	39	48	1	10	19	28
38	47	7	9	18	27	29
46	6	8	17	26	35	37
5	14	16	25	34	36	45
13	15	24	33	42	44	4
21	23	32	41	43	3	12
22	31	40	49	2	11	20

Magic Squares of an Even Order.—To construct a magic of the sixth order proceed according to the following rule which is a modified form of a method due to La Hire.

E

1	5	4	3	2	6
6	2	4	3	5	1
6	5	3	4	2	1
1	5	3	4	2	6
6	2	3	4	5	1
1	2	4	3	5	6

F

0	30	30	0	30	0
24	6	24	24	6	6
18	18	12	12	12	18
12	12	18	18	18	12
6	24	6	6	24	24
30	0	0	30	0	30

G

1	35	34	3	32	6
30	8	28	27	11	7
24	23	15	16	14	19
13	17	21	22	20	18
12	26	9	10	29	25
31	2	4	33	5	36

As in his rule for odd squares two auxiliary squares are employed. For a square of the sixth order the first auxiliary square E is constructed as follows: First, fill the cells of the

H

1			4
	6	7	
	10	11	
13			16

I

1	15	14	4
12	6	7	9
8	10	11	5
13	3	2	16

two diagonals with the numbers 1, 2, 3, 4, 5 and 6, beginning on the left-hand side. Second, fill each of the remaining cells of the first column with the same number as that already in two of them or with the complementary number, i.e., with a1 or a6 in any way, provided that there are the same number of these numbers in the column. Third, cells horizontally paired with those in the first column are filled with the complementary numbers. Fourth, the remaining cells in the second and third columns are filled in an analogous way to that in which the cells in the first column were filled; and then the cells horizontally paired with them are filled with the complementary numbers. Observe that in the case of a singly even magic square it will be necessary in constructing E to take care in the second step that in every row at least one cell which is not in a diagonal shall have its vertically paired cell filled with the same number as itself.

The second of the auxiliary squares F is constructed as follows: Rewrite square E, making another square F in which the left-hand column of E (beginning with its top number) becomes the top row of the new

K

71	64	69	8	1	6	53	46	51
66	68	70	3	5	7	48	50	52
67	72	65	4	9	2	49	54	47
26	19	24	44	37	42	62	55	60
21	23	25	39	41	43	57	59	61
22	27	20	40	45	38	58	63	56
35	28	33	80	73	78	17	10	15
30	32	34	75	77	79	12	14	16
31	36	29	76	81	74	13	18	11

square, the second column of E becomes the second row of the new square, and so on. Then instead of each of the numbers 1, 2, 3, 4, 5 and 6, substitute the corresponding number from the series 0, 6, 12, 18, 24 and 30. The result is square F. Next, if in each cell of G the sum of the numbers in the corresponding cells of squares E and F be placed, the required magic square is formed.

The following method is applicable to the construction of doubly even magic squares only. Imagine the square to be divided into squarelets of four cells each, the four central cells comprising one; and conceive these squarelets to be of *two* kinds, alternating with each other. Place 1 in the left-hand upper corner cell, and proceed horizontally to the right counting a number to each cell, but filling successively the squarelets of one kind only. When the end of one row is reached turn to the left-hand cell of the next row and again advance, filling cells of one kind as before, and so on. For the

L

1	63	62	4	5	59	58	8
56	15	49	48	19	44	20	9
55	47	25	39	38	28	18	10
11	22	36	30	31	33	43	54
53	42	32	34	35	29	23	12
13	24	37	27	26	40	41	52
14	45	16	17	46	21	50	51
57	2	3	61	60	6	7	64

4-square the result of this operation is seen in diagram H.

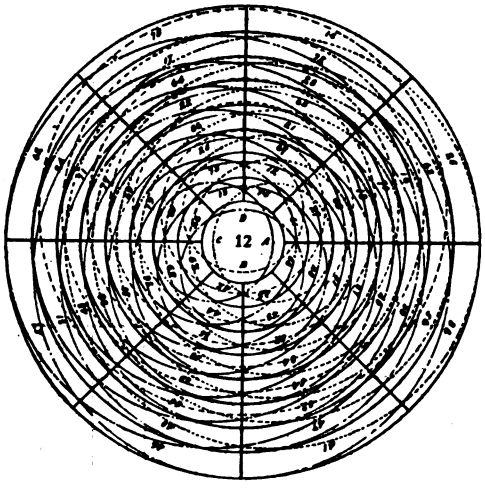
Next, begin with the right-hand lower corner cell, considering 1 as falling on it but not writing the number, and proceed regularly to the left, row after row, filling the empty cells with the numbers belonging to them but not writing numbers in the cells already filled. The result of the two operations is the magic square I. This is the most perfect magic square of the fourth order. Not only do the horizontal, vertical and diagonal lines of numbers sum up 34, but there are 33 other ways in which sets of four numbers may be selected whose sum is 34, making 48 ways in all. By the interchange of rows and columns according to the rule enunciated above, other squares may be formed, but none so perfect as this.

The above methods for the construction of magic squares are, in the writer's opinion, the simplest of all those proposed. Limited space permits only two other methods to be noticed, which, however, are applicable to only a limited class of cases. The first relates to the construction of composite magic squares. For example a square of 81 cells may be considered as made up of 9 smaller squares each containing 9 cells. The magic square in diagram K is built up by this method.

The other method consists in surrounding a magic square with a border of cells, constituting what is termed a concentric square. In

this way from the magic square of the third order can be built up squares of any odd order; and similarly even magic squares of any order may be built up from the magic square of the fourth order. Diagram L is constructed this way.

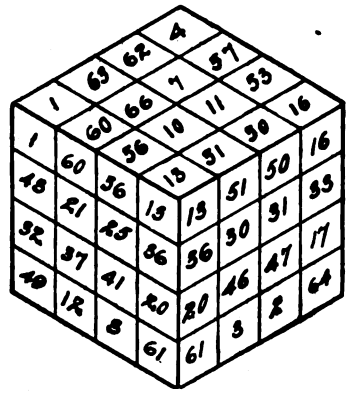
M



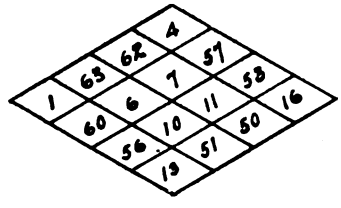
To Dr. Franklin is due the construction of diagram M which he called *The Magic Circle of Circles.* (See the illustration herewith). It is composed of a series of numbers from 12 to 75, inclusive, placed in eight concentric circular spaces and arranged in eight radii, with the number 12 in the centre. Like the centre this number is common to all the circular spaces and to all the radii. The numbers are so placed that the sum of all those in any of the circular spaces, together with the central number 12, is 360, the number of degrees in a circle. The numbers in each radius together with the central number make 360. The numbers in half of any of the circular spaces taken above or below the horizontal diameter, with half the central number, make 180, the number of degrees in a semi-circle. If any four adjoining numbers be taken, as if in a square, in the radial division of the circular spaces, the sum of these with half the central number is 180. There are, moreover, included five sets of other circular spaces bounded by circles which are eccentric with respect to the common centre. The centres of the circles which bound them are at A, B, C and D. The numbers in these eccentric circular spaces possess the same magic properties as the numbers in the first-mentioned circular spaces.

Magic squares have been developed into figures of three dimensions termed magic cubes. Diagram N is a magic cube of the fourth order. 1, 2, 3 and 4 are horizontal sections of N

N



1



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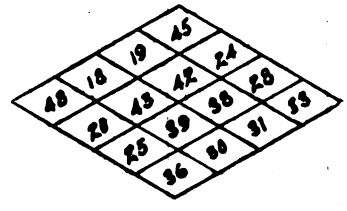

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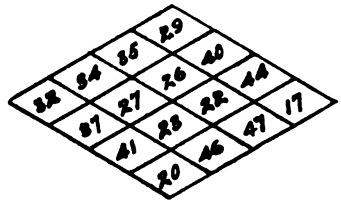
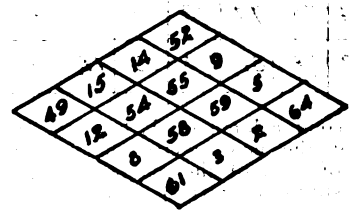


4



numbered from the top down. There are 52 ranks of numbers in this cube which sum up 130, namely, 16 vertical columns, 16 horizontal rows from front to back, 16 horizontal rows from left to right, and four diagonal lines uniting four pairs of opposite corners. The sum of any two numbers which are diametrically opposite each other and equidistant from the

O

30	21	6	15	28	19
7	16	29	20	5	14
22	31	8	35	18	27
9	36	17	26	13	4
32	23	2	11	34	25
1	10	33	24	3	12

centre of the cube equals 65; and the sum of the numbers in the 48 sub-squares of four cells each is 130.

Among curiosities in magic construction may be mentioned the following: The square in diagram O is filled with the natural numbers in the path of a knight returning to its starting cell, and possesses the property that the difference of any two numbers equidistant from and on opposite sides of the centre is 18. It is due to Euler, the famous mathematician.

W. S. Andrews in his *Magic Squares and Cubes* gives a magic cross filled with 145 numbers, with the statement that it contains the almost incredible number of 160,144 different columns of 21 numbers whose sum is 1,471.

A certain class of magic squares has received much attention in recent years. They are called *Nasik squares* in England, and in France *diabolic squares*. They are formed so that the sums along certain lines, such as all the rows, columns, diagonals and broken diagonals are the same. Diagram P is a unique example, as it is composed entirely of prime

P

1013	251	449	911	881
839	1301	941	113	311
41	173	701	1229	1361
1091	1289	461	101	563
521	491	953	1151	389

numbers. It is due to the ingenuity of C. D. Schuldham and appeared in a recent number of *The New York Sun*.

This square possesses the Nasik properties above mentioned, and in addition the sum of any two numbers equidistant from the centre and opposite each other is 1,402, or twice the central number.

Magic rectangles, crosses, stars, cylinders, etc., have been constructed, but want of space forbids any further notice of them.

Varying estimates as to the possible number of magic squares of a given order have been made by different investigators. W. W. Rouse Ball in his *Mathematical Recreations* thinks that those of the fifth order probably exceed half a million. Theodor Hugel in his *Die Magischen Quadrate* has calculated that the paper required to contain all the magic squares of the 13th order would cover the whole surface of the earth about 348 times.

As to the scientific value of magic squares the following paragraph is quoted from a paper by Maj. P. A. McMahon, F.R.S., published in *Proceedings of the Royal Institution of Great Britain*, 1892. "What was at first merely a practice of magicians and talisman makers has now for a long time become the serious study of mathematicians. . . . It was considered possible that some new properties of numbers might be discovered. . . . This has in fact proved to be the case, for from a certain point of view the subject has been found to be intimately connected with great departments of science such as the Infinitesimal Calculus, the Calculus of Operations, and the Theory of Groups."

A. B. Nelson.

MAGIC WOOD, a wood used in cups which were sent to Spain in the 16th century as presents to princes, and were highly valued first as curiosities and later as a means of health. The "magic" consisted in the fact that water put into the cup speedily turned a rich blue. Although it has been a subject of inquiry ever since it is not until lately that the wood has been identified botanically, and the cause of its effect on water is still unknown. The identification was made by William E. Safford, of the United States Department of Agriculture, who described the result of his investigation in *The American Museum Journal* (New York, Vol. XVIII, p. 48, 1918) with a colored illustration. He has discovered that two separate kinds of wood are involved in the history of this matter. The description of the early writers mostly refer to a shrub of Mexico called sweet-wood (*Eysenhardtia polystacha*); but the cups were made of wood of the gigantic narra tree (*Pterocarpus indicus*) of the Philippines. Although very different botanically, both produce effects on water virtually indistinguishable; and as in early times most of the communication between Spain and the Philippines was by way of Mexico, the double confusion as to origin easily arose. When water was poured into the narra cups, or chips of the Mexican sweet-wood were infused in a glass, the water became fluorescent in beautiful colors. In the early accounts of the cups (Pterocarpus) it was said that the water at once turned blue, which deepened if left to stand for some time. When this water was poured into a flask and held to the light it appeared perfectly clear, "but if you move this glass phial toward a more shady place the liquid will assume a most delightful greenness, and if to a still more shady place, a reddish color. . . . In the dark, however, or in an opaque vase, it will once more assume its blue color." As was customary in those days this changeably tinted

water was regarded as having medicinal value, especially in any disorder of the kidneys, and was carried to Europe in great quantities and thus used under the name *lignum nephriticum*. Mr. Safford got similar colors from the Mexican shrub. A few small chips in ordinary tap-water tinged it a golden yellow, which soon deepened to orange. When the glass was held against a dark background the liquid glowed with a beautiful peacock fluorescence very much like that seen in quinine. Placed partly in a sunbeam, half of the liquid appeared yellow and the other half blue; "and when the sunlight was focussed upon it by the lens of a common reading-glass the vial seemed to be filled with radiant gold penetrated by a shaft of pure cobalt." The most ingenious investigation has failed thus far to reveal the cause of this fluorescence.

MAGIE, mą-gē', **William Francis,** American physicist: b. Elizabeth, N. J., 14 Dec. 1858. He was graduated at Princeton in 1879 and afterward studied at the University of Berlin. He was instructor in physics at Princeton in 1879–84, became professor in that branch upon his return from Berlin, in 1885, and has been dean of the faculty since 1912. He is a member of the American Philosophical Society, and in 1910 served as president of the American Physical Society. Author of 'The Second Law of Thermodynamics' (1899); 'A Course of Lectures on Physics' (1904); 'Principles of Physics' (1911). He also translated Christiansen's 'Elements of Theoretical Physics' (1896); and revised Anthony and Brackett's 'Physics' (1896).

MAGINN, ma-gĭn', **William,** Irish author: b. Cork, Ireland, 11 Nov. 1793; d. Walton-on-Thames, 20 Aug. 1842. He was graduated from Trinity College, Dublin, in 1811, and was for some years a schoolmaster. In 1819 he became a contributor to *Blackwood's Magazine* and was in turn Paris correspondent of the *Representative,* junior editor of the *Standard* and one of the founders of *Fraser's Magazine,* his contributions to which made it famous. He was a man of superb classical education, excelled as a critic and his literary work abounded in rich fancy and the genuine Irish wit. Unfortunately he had no financial ability and he died in extreme poverty notwithstanding the large sums his pen had earned. His collected works were published in five volumes in 1855–57. Consult Krans, 'Irish Life in Irish Fiction' (New York 1903).

MAGINNIS, Charles Donagh, American architect: b. Londonderry, Ireland, 1867. He was educated at Cusack's Academy, Dublin, and won Queen's prize in mathematics at South Kensington, London, in 1883. He came to the United States in 1885, engaged in practice as an architect at Boston in 1886 and became a member of the firm Maginnis and Walsh. He is especially interested in ecclesiastical architecture. He is a member of the Municipal Art Commission, Boston, and of the Massachusetts State Art Commission. He has written and illustrated articles on architecture for professional magazines and is author of 'Pen Drawing' (1898).

MAGISTRATE. See COURT.

MAGLIABECCHI, Antonio, än-to'nē-ō mäl-yä-bĕk'ē, Italian bibliographer: b. Florence, 28 Oct. 1633; d. there, 4 July 1714. In the early part of his life he was engaged in the employment of a goldsmith, which he relinquished to devote himself to literary pursuits. Through unremitting application he acquired a multifarious stock of erudition, which made him the wonder of his age. Duke Cosimo III made Magliabecchi keeper of the library which he had collected and gave him free access to the Laurentian Library and the Oriental MSS., and of the latter collection he published a catalogue. He left no literary work, but freely afforded information to authors who sought his assistance in their own undertakings, his prodigious memory enabling him to furnish the exact reference to any page or paragraph of the numberless volumes he had read. He left his valuable private library of 30,000 volumes to his native city where it now forms part of the National Library.

MAGMA, rock which is in a fluid condition due to heat, and commonly said to be molten. For a discussion of the modern conception of a magma see the article on ROCKS. See also VOLCANOES and the section on *Volcanism* in the article on GEOLOGY.

MAGMATIC SEGREGATION, or **MAGMATIC DIFFERENTIATION.** Due to processes but little understood, when an igneous rock passes from the molten to the solid state, there is frequently shown a tendency for like particles to segregate in masses. These may form at the margin of the igneous mass, or constitute irregular bodies within the parent rock itself, or may even force themselves as veins into fractures in the already cooled portions of the outer part of the magma. The process is known as magmatic segregation, or magmatic differentiation. Large bodes of magnetic iron ore in the Adirondacks and in Sweden, and of nickel-bearing pyrrhotite at Sudbury, Ontario, are believed to be of this origin. See VEIN, MINING.

MAGMATIC STOPING, the process by which a fluid rock mass (magma) heats the overlying rock till it fractures and portions break off and settle into the magma, there to be assimilated or to remain as solid blocks or Xenoliths. The process is believed to be important in the mechanics of igneous intrusion. See ASSIMILATION and XENOLITHS.

MAGMATIC WATER. See GROUND WATER.

MAGNA CHARTA, măg'na kär'ta, or **GREAT CHARTER OF LIBERTIES,** a famous document extorted from King John of England by the confederated barons in 1215. The barons who with their followers composed "the Army of God and the Holy Church" were the whole nobility of England; their followers comprehended all the yeomanry and free peasantry, and the accession of the capital was a pledge of the adherence of the citizens and burgesses. John had been obliged to yield to this general union, and in June both parties encamped on the plain called Runnymede, between Windsor and Staines, on the banks of the Thames, and conferences were opened between the king and his barons. The preliminaries being agreed upon, the barons presented heads of their grievances and means of redress, in the nature of the bills now offered by both

houses for the royal assent. The king, according to the custom which then and long after prevailed, directed that the articles should be reduced to the form of a charter, in which state it issued as a royal grant. The charter was signed on 15 June. Copies were immediately sent to every county or diocese and ordered to be read publicly twice a year. To secure the execution of the charter John was compelled to surrender the city and Tower of London, to be held by the barons till 15 August, or until he had completely executed the charter. King John, though he signed the charter, had no intention of keeping it; he appealed to the Pope, who in a bull declared Magna Charta "null and void" and excommunicated the barons who had obtained it; and he was conducting a war against his barons when death overtook him in May 1216. Many parts of the charter were pointed against the abuses of the power of the king as lord paramount; the tyrannical exercise of the provisions of the forest laws was checked, and many grievances incident to feudal tenures were mitigated or abolished. But besides these provisions it contains many for the benefit of the people at large, and a few maxims of just government, applicable to all places and times, of which it is hardly possible to overrate the importance of the first promulgation by the supreme authority. One of these provided that taxes should not be imposed without the consent of the Common Council of the realm. The 39th article contains the celebrated clause which forbids arbitrary imprisonment and punishment without lawful trial. This article contains the writ of habeas corpus and the trial by jury, the most effectual securities against oppression which the wisdom of man has devised, and the principle that justice is the debt of every government, which cannot be paid without rendering law cheap, prompt and equal. The provision which directs that the Supreme Civil Court shall be stationary, instead of following the king's person, was an important safeguard of the regularity, accessibility, independence and dignity of public justice in Great Britain. Confirmation of the Great Charter was frequently made by English monarchs. Consult Stubbs, 'Constitutional History of England' (1897).

MAGNA GRÆCIA, grē'shī-ą, "Great Greece," the name commonly given in ancient times to that part of southern Italy which was inhabited by Greek colonists. Apparently the name was in use as early as the time of Pythagoras (586–506 B.C.). Strabo includes the Greek cities of Sicily under the appellation, but the name refers generally only to the Greek cities in the south of Italy, including those on the shores of the Tarentine Gulf and the Bruttian Peninsula, with Velia, Posidonia and Laüs, on the west coast of Lucania. The name was not at first territorial or coextensive with any region, but applied merely to the Greek cities on the coasts, Cumæ was the most ancient of all the Greek settlements in Italy, but from its remote position it was in a great measure isolated from the later Greek settlements. The Achæans were the real colonizers of southern Italy, their first settlement being Sybaris (720 B.C). A few years later (708 B.C.) Spartan colonists founded Tarentum, and to counteract their encroachments the Achæans founded Metapontum, on the frontier of the territory of the Tarentines, between 700 and 680 B.C. The Locrians founded further south the city known as Locri Epizephyrii, nearly contemporary with Crotona (710 B.C.). The Chalcidic colony of Rhegium, on the Sicilian Straits, claims to have been more ancient even than Sybaris. The Greek cities on the shores of Bruttium and Lucania were, Velia excepted (540 B.C.), offshoots from the earlier settlements, and not founded by colonists direct from Greece. The arrival of Pythagoras at Crotona (530 B.C.) produced a marked change in the cities of Magna Græcia, and led to the introduction of great political changes. He and his followers were ultimately expelled from Crotona. Very little of the early history is known. The coast cities were essentially mercantile. Trade was well developed, and in the 6th century there was an extensive commerce, especially with Greece. The colonists who pushed to the interior subdued the opposing natives and developed the fertile plains into agricultural settlements. There was a high development of intellectual life. At various times there were temporary alliances among the cities, but never a permanent federation. Warfare was common and bitter and to this fact is largely due the decline of the territory. Magna Græcia comprised the provinces of Campania, Apulia, Iapygia, Lucania and Bruttium.

MAGNALIA CHRISTI AMERICANA, măg-nā'lī-ą krĭs'tī ā-mer-ĭ-kā'ną, an 'Ecclesiastical History of New England, from 1620 to 1628,' published by Cotton Mather in 1702. It treats more extensively of the early history of the country than its title seems to indicate, and is divided into seven books: the first treating of the early discoveries of America and the voyage to New England; the second is 'Lives of the Governors'; the third, 'Lives of many Reverend, Learned and Holy Divines'; the fourth, 'Of Harvard University'; the fifth, 'The Faith and the Order in the Church of New England'; the sixth, 'Discoveries and Demonstrations of the Divine Providence in Remarkable Mercies and Judgments on Many Particular Persons'; the seventh, 'Disturbances Given to the Churches of New England.' In the sixth book the author gives accounts of the wonders of the invisible world, of worthy people succored when in dire distress, of the sad ending of many wicked ones and of the cases of witchcraft at Salem and other places.

MAGNENTIUS, măg-nĕn'shĭ-ŭs, **Flavius Popilius,** Roman imperial usurper of the West: d. 11 Aug. 353. Having been entrusted by Constans with a high military command he availed himself of his office to plot the emperor's overthrow. On 18 Jan. 350, presenting himself in imperial purple at a great banquet given by one of the conspirators at Autun, he was saluted with the title of Augustus; and assassins sent for the purpose having dispatched Constans, Magnentius was acknowledged as emperor by all the western provinces except Illyria. Constantius, on hearing of his brother's murder, hastened from the confines of Persia and defeated Magnentius (351). These disasters led to the defection of all the countries that had recognized the usurper, who thereupon committed suicide. Constantius then became master of the entire empire.

MAGNESIA, the oxide of magnesium, MgO. See MAGNESIUM.

MAGNESIAN LIMESTONE, a rock consisting of the mixed carbonates of lime and magnesia. Mineralogically it is known as DOLOMITE (q.v.).

MAGNESITE, a white, porcelain-like mineral (magnesium carbonate, $MgCO_3$; carbon dioxide 52.4 per cent, magnesium oxide 47.6 per cent), with a hardness of 3.5 to 4.5, and a specific gravity of 3.0–3.1. It is usually found associated with serpentine, talcose slates and dolomite. The magnesite of commerce comes from several localities, notably, Veitsch in Styria, Austria, where it occurs in conformable beds in a Silurian formation; at Frankenstein in Silesia, where a very pure variety is found; at Bolton, Canada, there is a ledge 60 feet wide which is tinged with green by chromium. The quality, however, is not good. In the Red Mountain mining district, Santa Clara and Stanislaus counties, Cal., is found the largest known deposit in the world. Here there are several veins from 20 to 60 feet wide and of very pure quality. It is also found in Napa, Sonoma, Fresno, Placer, Mariposa, Monterey and San Luis Obispo counties, Cal. Magnesite is used as a bleaching agent in paper-making and for making an excellent artificial stone for interior decoration. Its chief use, however, is in the manufacture of firebrick. In brick-making it is calcined, the gas CO_2 being collected and sold for charging mineral water and for use in cold-storage plants, instead of ammonia, and the resulting magnesium oxide mixed with a binding material and pressed into brick. From the pure mineral metallic magnesium and salts, as Epsom salts and magnesium chloride, are manufactured. See MINERAL PRODUCTION OF THE UNITED STATES.

MAGNESIUM, a metallic element whose compounds are abundant and widely distributed, but which does not occur, in nature, in the metallic form. Magnesium resembles calcium in its chemical deportment, and the oxides of the two metals were long confused with each other. Metallic magnesium was first prepared by Davy, in 1808, both by electrolysis and by the reduction of white-hot magnesia in an atmosphere of potassium vapor. In 1830 Bussy obtained a larger and purer yield of the metal, by heating a mixture of potassium and anhydrous magnesium chloride to redness. It is best prepared by the electrolysis of the fused anhydrous chloride or of a mixture of magnesium chloride with the chlorides of sodium, potassium and ammonium. Pure magnesium is silvery-white in color, lustrous and moderately hard. It may be hammered, rolled, filed and polished. Its specific gravity is about 1.75 and its specific heat about 0.245. Its melting point is variously given, the estimates ranging from 850° F. to nearly 1,500° F. When raised to a bright-red heat (out of contact with the air) it volatilizes, depositing upon cool surfaces again in the form of lustrous silvery crystals which belong to the hexagonal system, and are isomorphous with those of zinc. It expands by 0.000015 of its own length, per Fahrenheit degree of rise of temperature; and at 32° F. its electrical resistance is 0.0438 of that of mercury.

Chemically, magnesium is a dyad. It has the symbol Mg, and an atomic weight of 24.36 if O = 16, or 24.18 if H = 1. Its most important compounds are the oxide, MgO, the chloride, $MgCl_2$, the sulphate, $MgSO_4$, and the carbonate, $MgCO_3$. Metallic magnesium is not altered upon exposure to dry air, but ordinary air oxidizes it superficially. It dissolves readily in dilute acids, with the formation of the corresponding salts. Chlorine, bromine, iodine, fluorine, sulphur, phosphorus and arsenic combine with it directly. Red-hot metallic magnesium also slowly combines with free nitrogen to form a solid nitride. In the isolation of argon, helium and the other rare gases of the atmosphere advantage is taken of this fact for separating these gases from the nitrogen of the air. (See ARGON). When strongly heated in the air, metallic magnesium takes fire and burns with an exceedingly brilliant white light that is rich in chemical rays; the product of the combustion being magnesia, MgO. Advantage is taken of this property in photography, most of the "flash-light" powders that are used consisting essentially of pulverized magnesium, either alone or mixed with a small quantity of some explosive or oxidizing agent. Magnesium will also burn when sufficiently heated in steam, carbon dioxide or sulphur dioxide.

Magnesium oxide, or "magnesia," MgO, is usually prepared by heating the nitrate or carbonate of the metal; and on account of this method of preparation it is commonly known as "calcined magnesia." Magnesia is a white substance, without taste or odor. It does not have a strongly alkaline reaction, but it acts as a powerful base, reacting with acids to form the magnesium salts. It is scarcely soluble in water, but it slowly absorbs moisture and carbon dioxide from the air, becoming converted into a mixture of the hydrate and carbonate. When made into a paste with water, magnesia sets to a hard, white mass, consisting partly or wholly of the hydrate, $Mg(OH)_2$; but this action does not occur if the magnesia has been previously heated to whiteness. One of the most distinctive characteristics of magnesia is its infusibility. Even when heated in the flame of the oxyhydrogen blowpipe it does not melt, but gives out a bright white light, somewhat similar to that emitted by lime. (See CALCIUM LIGHT). In the fiercer heat of the electric furnace, magnesia has been melted. On account of its infusibility magnesia is used in the manufacture of crucibles and of firebrick. It occurs native as the mineral periclase, which crystallizes in the isometric system.

Magnesium chloride, $MgCl_2$, is prepared by dissolving magnesia in hydrochloric acid, and evaporating the solution after the addition of a certain quantity of sal ammoniac. Upon subsequent fusion the sal ammoniac volatilizes and the magnesium chloride is left behind. This substance is largely used as a preventive of mildew, in the sizing of cotton cloth. The mineral carnallite contains magnesium chloride, having the composition $MgCl_2 + KCl + 6H_2O$. Magnesium sulphate occurs native (in combination with one molecule of water) as kieserite, and it may also be prepared artificially by dissolving magnesium oxide or carbonate in dilute sulphuric acid. When combined with seven molecules of water, magnesium sulphate constitutes the familiar substance known as Epsom salts (q.v.), which is largely used in medicine. Magnesium carbonate, $MgCO_3$, is a white sub-

stance, insoluble in water, but soluble in a solution of ammonium chloride, and also in water that contains carbon dioxide in solution. It occurs in nature as the mineral magnesite, which crystallizes in rhombohedral forms, isomorphous with calcite. Dolomite, which occurs in nature in enormous quantities, is a carbonate of magnesium and calcium.

Magnesium salts are used to a considerable extent in medicine. The name "magnesium" is derived from "magnesia," which substance is said to have been obtained from the province of Magnesia in Thessaly.

MAGNESIUM, Electric Production of. See ELECTROCHEMICAL INDUSTRIES.

MAGNETIC DIP. See DIPPING NEEDLE.

MAGNETIC FIELD. See ELECTRICAL TERMS.

MAGNETIC FLUX. See ELECTRICAL TERMS.

MAGNETIC MOMENT. See MAGNETISM.

MAGNETIC POLE. See MAGNETISM.

MAGNETIC SEGREGATION, a process or processes in the preparation of ore by which the more valuable minerals are separated from the waste material and from each other by the use of magnets. A usual type of segregator consists of a belt conveyor carrying the ores below the magnet which raises the magnetic ore to another belt traveling at right angles to the first. As it passes out of the magnetic field the segregated ore drops into a receptacle. By weakening or strengthening the magnetic field it becomes an easy matter to separate the non-magnetic from the magnetic, and the weakly magnetic from strongly magnetic.

MAGNETISM, the name applied to a peculiar force action first observed in connection with certain iron ores. This ore, often called lodestone, is supposed to have been discovered in Magnesia, a part of Asia Minor. It is not possible to state just when this discovery was made, but certain passages in Lucretius show that something was known concerning it before the beginning of the Christian era. About the year 1200 we have the statement by Neckham that a lodestone free to turn takes up a definite position in space. Some further details were noted by Peregrinus (1269) and Ferrara (1629), but the greatest of the early works is that of Dr. Gilbert, a physician, who published his 'De Magnete' in 1600. Those interested in the history of the subject may consult the 'Intellectual Rise of Electricity' by Park Benjamin, in which an excellent historical sketch may be found.

The only direct evidence that a body is magnetic is its ability to exert a force on certain substances, which, by reason of their susceptibility to this action, are called magnetic substances. A lodestone brought in contact with several small bodies will select those of iron or steel, if such be present, but show no appreciable force on copper, lead, wood or in fact on any except iron, nickel, cobalt, certain rare metals and certain alloys, discovered by Hensler, of relatively non-magnetic metals, and a few others to a lesser degree. Of even greater interest and importance is the fact that the lodestone is able to endow steel or iron with the ability to exert this force. Soft iron loses its external magnetic qualities when removed from the immediate neighborhood of the exciting source, but hard steel or iron will retain this property for a long time. If a bar or rod of hard steel is drawn across a piece of lodestone or other permanent magnet and is then suspended so as to be free to turn about a vertical axis it will take up a definite position, usually its line of greatest length will be approximately north and south. If it be plunged into a box of iron filings, little magnetic action will be manifest near the middle of the bar, but near the ends considerable quantities of filings will be attracted and may be lifted against the action of gravity. These facts led to the naming of the regions of greatest external action the poles of the magnet and since the lines joining these regions would, in the case of a freely suspended magnet, lie in many places nearly north and south, the pole which seeks the north is often called the north-seeking or positive pole, the other which turns toward the south is correspondingly named the south-seeking or negative pole. The entire subject was formerly studied with reference to the behavior of like and unlike poles, and it was even supposed that these poles consisted of opposite sorts of magnetic matter. Later investigations have developed methods less directly dependent upon the idea of poles, which are preferable for many purposes.

If we suppose two long magnets placed as shown in Fig. 1 a study of their mutual force

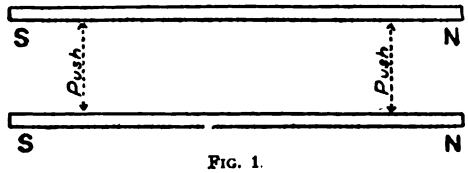


FIG. 1.

action would indicate that each is exerting a push tending to increase the distance between them, and that the amount of this repulsion will vary with the distance between the magnets. If one of the bars be replaced by another whose magnetic quality is different the force action will be modified. If one of the magnets be reversed in position a corresponding force tending to reduce the distance between the bars would be observed. It is convenient to use as a preliminary definition the statement that a unit pole is one which would exert unit force upon a precisely equal pole at a distance of one centimeter. The law of pole action can then be stated by saying that the force is equal to the product of the two poles strengths divided by the square of the distance between the poles.

If a freely suspended magnet is brought into

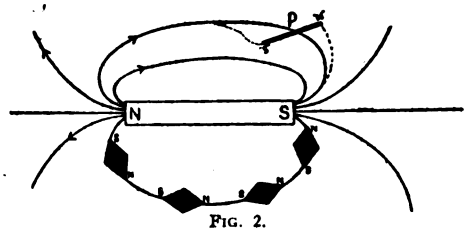


FIG. 2.

the neighborhood of a large bar magnet as indicated in Fig. 2 it will be observed to take up a position somewhat as indicated in the lower

part of this diagram, as its point of suspension is moved along the line. The region where this directive force is noticeable is called the *field* of the magnet. (Gilbert's "orb of virtue"). If continuous lines are drawn, which at each point have the direction taken by the free magnet, these lines are called lines of magnetic force, and they offer a very convenient method for a general study of magnetic action. While these lines have no objective existence, it is, nevertheless, desirable to imagine that they are real and that they possess certain definite qualities. They should always be considered as being directed away from the north-seeking or positive pole. In the early conception of magnetic action these lines would have been regarded as the lines of flow of the magnetic material, and the word flux, still in use, bears evidence of this conception. It is convenient also to regard the lines of force as being under tension and capable of repelling each other. The number of actual lines of force which could be drawn about a magnet is infinite. For purposes of comparison, however, it is customary to represent the force action at a point upon the unit pole placed at that point by the number of lines drawn per square centimeter on a surface perpendicular to the field. A unit field is one in which a force action upon a unit pole is one dyne, about the weight of 1–1000 of a gramme.

In order to compare magnets and to facilitate magnetic computations, certain methods of measurement have been devised. Only a brief sketch can be given here, as full details of these operations may be found in books devoted to this subject, some of which will be mentioned at the end of this article. When a bar magnet is placed at right angles to the lines of a uniform magnetic field it will experience a twist tending to place it along these lines. The amount of this twist will depend upon three things. First: The pole strength of the magnet in question. Second: The distance between the poles. Third: The strength of the field where it is placed. The product of the pole strength by distance between poles is called the magnetic moment of the magnet. When a magnet is suspended freely and slightly displaced from a position parallel to the lines of force it will vibrate about this position. The time required for a complete swing is found to depend upon the magnetic moment, the moment of inertia and the strength of the field where the magnet is placed. The vibration period may be directly observed and the moment of inertia computed from the dimensions and weight of the magnet. In this way the product of the magnetic moment by the field strength may be found. If the same magnet is held with the line joining its poles east and west it will cause a small freely suspended magnet some distance to the east or west to turn slightly from its equilibrium position. The amount of this deflection depends on the distance between the magnets and the ratio of *magnetic moment* to *field strength*. If we denote the magnetic moment by ml and the field strength by H, the product of ml times H is found from the time of vibration, and by means of the deflection of the small auxiliary magnet $\frac{ml}{H}$ may be determined. When ml times H or ml divided by H is known either ml or H is readily computed. When the field at any point is known, a comparison of the time of vibration of a magnet at the known point with its period when vibrating at any other point enables us to compare the two fields without further measurement. The law of change being that if periodic time is doubled the field strength would be four times as great; or the period varies inversely as the square foot of the field in which the magnet vibrates.

The facts mentioned above regarding the ability of a magnet to cause pieces of neutral iron or steel to show magnetic properties is frequently spoken of as magnetic induction. The general phenomena can be readily remembered if we imagine that it is easier for lines of magnetic force to pass through iron than through air. Small pieces, as shown at P, Fig. 2, would have lines entering at "S" and leaving at "N" and would behave as small magnets placed in corresponding positions. Owing to the tension of the lines of force these small pieces would tend to set themselves nearly parallel to the undisturbed direction of the lines. If a sheet of glass or other non-magnetic material is placed over a magnet and iron filings are sprinkled on its surface, a slight tapping, sufficient to overcome friction, will enable the lines of force to arrange the small temporary magnets parallel to the field. In this way maps of magnetic fields may be readily found, and their study throws considerable light upon many details of these peculiar phenomena. Such fields are shown in Figs. 3 and 4. If a sphere of iron or cobalt is free to move in a magnetic field which is not uniform, a tendency is always observed for the iron to place itself in the strongest part of the field, or so that as many of the magnetic lines pass through it as possible. Such a substance is called paramagnetic. Some substances, as for example a sphere of bismuth, will tend to move to the weaker portions of the field, indicating that it is more difficult for magnetic lines to pass through the material than through air. These are called diamagnetic bodies.

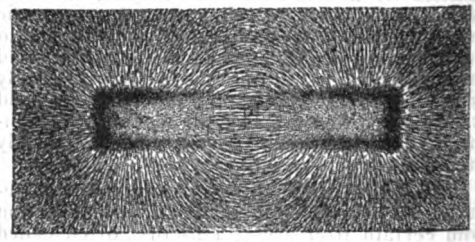


FIG. 3.

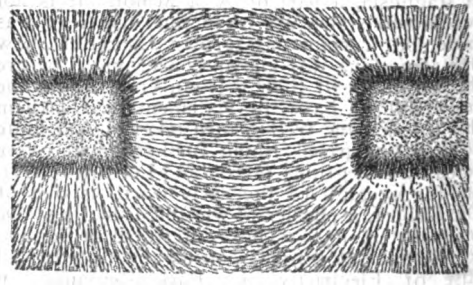


FIG. 4.

The importance of magnetic action in both theoretical and practical affairs is due largely

to its intimate connection with the phenomena of the electric current. In fact it is absolutely impossible under any conditions to have an electric current flow in a conductor without producing a magnetic field. In the case of a long straight wire carrying current the magnetic lines are circular in form, concentric with the wire, and their planes are perpendicular to its axis. If a wire is wound in a long, straight, cylindrical coil, frequently called a solenoid, and a current be passed through it, the field produced will be nearly identical with that of a bar magnet, the difference being that the lines of force are entirely in air and are not modified by the peculiar properties of iron. By increasing the strength of the current and the number of turns of wire, a comparatively strong magnetic field may be produced at the centre. A piece of soft iron or steel inserted in the coil becomes a powerful temporary magnet, while strips or bars of hardened iron or steel would in the same way become permanent magnets. The requirements of modern electrical processes have led to very careful investigations of the magnetic behavior of iron in connection with the production and the measurement of electric energy. Only a brief sketch of the fundamental features can be given here. If we suppose an electric current flowing in a long solenoid, which does not contain an iron core, the strength of the magnetic field through the inside of the solenoid may be readily computed from a knowledge of the number of turns of wire and the strength of the current. The symbol H is generally used to indicate the field strength when iron is absent. If now a bar of iron be inserted it will be found that the magnetic field is greatly increased. The new field will depend partly on the original value of H and partly on the quality and previous magnetic history of the iron inserted. The symbol B is generally used to denote the intensity of the field when iron is present. It may then be stated that B equals μH, where μ is a variable factor depending on the nature of the iron and the field strength; this factor is called the *permeability*. The original field H is frequently spoken of as the magnetizing field and the new one as the induction. Or H stands for the number of lines per square centimeter where iron is absent and B stands for the number of lines per square centimeter in the iron. If iron, in a neutral magnetic condition, is placed in a solenoid and the electric current is gradually increased from zero the iron will be subjected to a steadily increasing magnetizing field. A comparison of corresponding values of B and H in such a case leads to very important results. The relation between these values is best explained by reference to a curve drawn by using these quantities as co-ordinates. Such curves, usually called the curves of magnetization, are shown in Fig. 5. It should be observed that when H is almost zero, the induction is very small, then B increases more and more rapidly with a rising field until at point two the rate of increase of B with H begins to fall off rapidly, and shortly a value of B is reached which cannot be materially increased no matter how strong a magnetizing field is used. For example in the specimens shown it is useless to extend the value of H much above 70, and in actual practice this limit would be taken much lower. When as many lines as possible are carried through the iron it is said to be saturated. The exact shape of the magnetization curve will depend upon the nature and previous magnetic history of the specimen, but the ratio B-H at any point gives the ability of the iron to multiply magnetic field strength for that particular

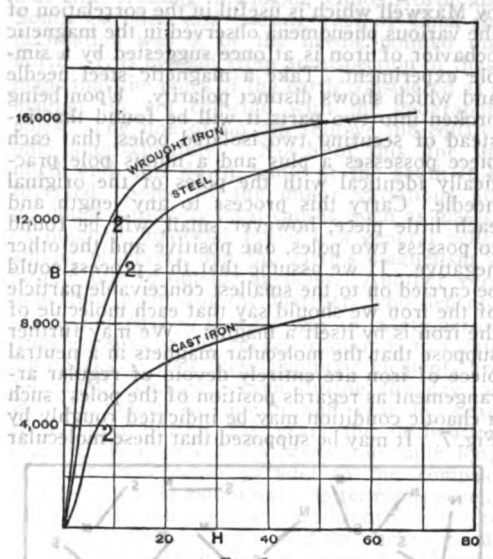


FIG. 5.

field. If, however, any definite state of magnetization is attained as at the point M, Fig. 6, it will be found that upon reducing the field, H, the values of the induction, B, will not agree with those found for the same value of H when the field was increasing. In fact if H be changed to zero and then to negative values and back again to the former condition the value of B will form a loop as indicated. This peculiar lag of the induction when the field is

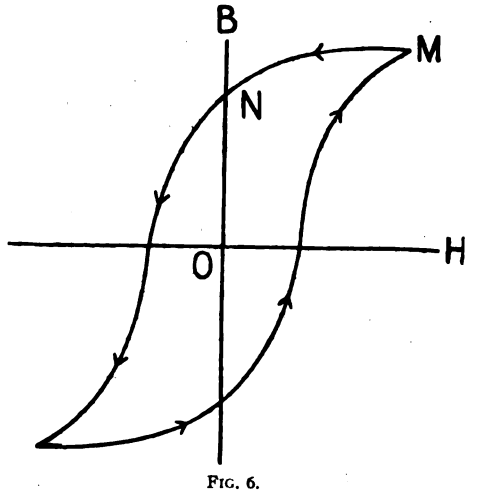


FIG. 6.

reduced is called hysteresis, and the hysteresis loop as shown is of practical importance because its area enables one to find the work converted into heat when the magnetization is carried through one complete cycle. The line ON measured the residual magnetism, which is

semi-permanent, and will be greater in hard than in soft iron or steel. No matter where the process of magnetization is stopped a series of cyclic changes of the magnetic field always gives corresponding loops.

A theory due to Weber and later improved by Maxwell which is useful in the correlation of the various phenomena observed in the magnetic behavior of iron is at once suggested by a simple experiment. Take a magnetic steel needle and which shows distinct polarity. Upon being broken into two parts it will be found that instead of securing two isolated poles, that each piece possesses a plus and a minus pole practically identical with the poles of the original needle. Carry this process to any length and each little piece, however small, will be found to possess two poles, one positive and the other negative. If we assume that this process could be carried on to the smallest conceivable particle of the iron we should say that each molecule of the iron is by itself a magnet. We may further suppose that the molecular magnets in a neutral piece of iron are entirely devoid of regular arrangement as regards position of the poles; such a chaotic condition may be indicated roughly by Fig. 7. It may be supposed that these molecular

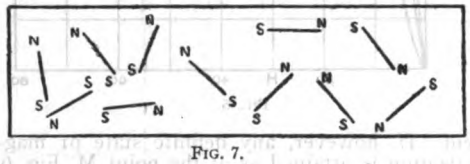


FIG. 7.

magnets are partly held in position by the action of forces analogous to friction, which also tend to hold them in any new position to a greater or less extent in case the original arrangement is disturbed. Under the action of a weak magnetic field these friction forces would prevent the turning of the molecular magnets into parallelism with the field lines. As soon as the field is strong enough to overcome this sort of friction we might expect the same tendency to arrangement of these minute magnets that is observed in the case of iron filings in the mapping of magnetic fields. As long as a considerable number of the axes of these molecular magnets make fairly large angles with the field lines the leverage by which turning is produced would be considerable; if however they approach parallelism with each other and the field lines, the effective twisting would be very materially reduced. This would correspond to the approximate saturation of the iron and no considerable change in position could be produced by increasing the field strength. The general arrangement may be indicated approximately in Fig. 8, where

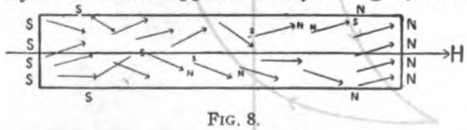


FIG. 8.

it will be observed that there is a tendency for free positive poles to appear at one end, namely, where the field lines leave the iron, and for uncompensated negative poles to appear at the other end.

The facts in favor of this sort of explanation may perhaps be briefly summarized as follows: (1) The general shape of the magnetic curve is explained. (2) As friction or other molecular forces tend to prevent a return to the original chaotic condition after magnetization this arrangement would in part persist after removal from the field, or permanent magnetism would be explained. (3) Soft iron should be easier to magnetize and less permanent than hardened iron or steel. (4) Jarring as by blows tends to reduce friction and to assist in the process of magnetization and also to reduce permanent magnetism. (5) High molecular activity consequent on rise of temperature decreases magnetic action, in fact, at a dull red heat iron is non-magnetic. (6) Rapid reversals of magnetism involves work against molecular forces and the production of heat, this heat is proportional to the area of the loop. (7) A tube of iron filings or a set of pivoted magnets shows the same behavior in a rising or falling magnetic field as a solid bar. The precise agreement between experimental facts and the indications from theory shown above makes this conception extremely useful. Just why molecules of iron should be permanently endowed with magnetic properties is a subject for speculation which has been indulged in by numerous prominent scientists. It has been supposed for example that electrical currents flow around these molecules, that they consist of vortex rings or that small electrically charged parts are in vibration in such a way as to produce the phenomena of permanent molecular magnetism. The general usefulness of the hypothesis is in no way connected with the truth or falsity of such speculations any more than the facts regarding free fall are dependent on our view of gravitation.

The general statements noted above regarding magnetism of iron are of importance in the manufacture and utilization of magnets for various purposes. Where a considerable amount of permanent magnetism is undesirable, soft iron or steel is always used. For the manufacture of permanent magnets special steel is selected and hardened and is then magnetized by its insertion into a solenoid carrying a powerful electric current. Severe shocks or blows are frequently given in order to assist in the molecular rearrangement. The interaction of all the elementary magnets together with temperature changes and mechanical shocks will tend to weaken a magnet. This loss is very considerable at first but finally an almost permanent state is reached. When used in electrical measuring instruments magnets are artificially aged by subjecting them to considerable changes of temperature and a series of mechanical shocks. It should be noted in this connection that the permanence of the magnet will be somewhat increased by joining its poles, when not in use, by a piece of soft iron. The induced magnetism at the ends of the iron helps to hold the poles of the small molecular magnets in position, and counteracts the tendency of these poles to demagnetize the bar.

Aside from the extended use of permanent magnets in electrical instruments their practicable application is comparatively limited. The electro-magnet is widely used where it is desired to cause a temporary force action at a distance from the operator, as for example in the telegraph, etc. Powerful electro-magnets are now frequently used to lift large masses of iron during manufacturing processes. It may

be noted in this connection that the lifting force of a magnetic piece of iron depends on the square of the number of lines per unit area at the contact face. Only so large an area should be used in contact as can be very highly magnetized by the current available. In the construction of dynamos, motors and transformers, the magnetic quality of the iron used is of great importance. The total number of lines set up (flux) must be sufficient for the operations involved and saturation should not be approached in any part. Where the cross section may be made large, cast iron can be used, but where the flux must be concentrated, special soft iron or steel is required. All air gaps are made as small as mechanical and electrical considerations of construction will permit, in order that the required flux may be more easily set up

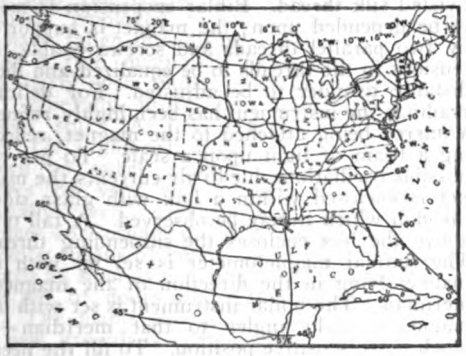


FIG. 9.

by the electro-magnets. Or as electrical engineers say, the magnetic "*reluctance*" is made small by use of properly proportioned iron parts and small air gaps in order that the *magneto-motive force* required may not be excessive.

Terrestrial Magnetism.— The statement usually made that a freely suspended magnet needle, remote from magnetic masses, tends to point north and south is not correct except for a few localities at certain times. The actual nature of the earth's magnetic field must be found by extended experiments which are being carried on by numerous observers largely under the direction of various governments. (See methods of magnetic measurements above). If a steel needle be suspended by a silk fibre and carefully balanced so as to hang horizontal and is then magnetized it will be observed to finally come to rest in a certain vertical plane and to be inclined to the horizontal. The angle between a horizontal line and the direction of the needle is called the dip, and the angle between the true north and south plane and that in which the needle lies is called the declination. The values of the dip, declination and intensity of the earth's field at a point are called the magnetic elements at that point. The use of the compass both by the surveyor and mariner over nearly the entire surface of the earth makes an accurate knowledge of these elements indispensable. In order to convey this information, in a practical way, recourse is had to maps on which places having the same declination, for example, are joined by lines. Such maps bring into view many interesting features as regards the earth's magnetism. For example, Fig. 9, published by the United States Coast and Geodetic Survey for 1900 shows that in northern Oregon, Idaho and Montana the compass pointed approximately 20 degrees east, while in the extreme northeastern part of Maine it pointed about 20 degrees west. Along an irregular line crossing Michigan, Ohio, North and South Carolina and passing east of Cuba the declination was 0, or the needle pointed due north. It is evident from an inspection of these maps that the poles of the earth considered as a magnet do not coincide with the geographic poles. The line of no dip follows the equator only approximately. North of this line the north end dips down, while at the south it is reversed. Some of the minor variations are no doubt caused by local causes, such as masses of magnetic material, but it is a general belief among observers that the earth's magnetism is largely due to outside agencies. Another very important point for the mariner, who depends on the compass to find his way in safety across trackless seas or the surveyor anxious to locate landmarks, is that these magnetic elements are continually changing even during the day, as well as month by month and year by year. In London during 232 years the declination changed 35 degrees. "A street one mile long laid out in London parallel to the compass direction in 1580 would have its terminus seven-tenths of a mile too far east according to the compass in 1812." Since 1812 the declination at London has changed from about 24 degrees west to 16 degrees west. In 1580 it was 11 degrees east. In fact it would seem that the magnetic poles of the earth are slowly vibrating. The periods of some of the components of this vibration are astronomical in origin — the day, the year, the lunar month, the sun-spot period, etc. The variation during the day must be taken into account in accurate work as a mile run in the morning and repeated in the afternoon may vary by 5 to 20 feet at its terminus. Sudden changes called magnetic storms also frequently occur, which seem to be associated with atmospheric electrical conditions, sun spots, etc. In order to secure data for the study of these complex phenomena, magnetic observatories are maintained where delicate instruments record, day and night, the countless fluctuations of the magnetic forces.

The problem of the navigator is still further complicated by the use of iron ships which are always sources of disturbance, both because of their permanent as well as their variable magnetism. The continual jarring and changes of temperature during a voyage enables the earth's field to continually change the distribution of magnetism in the vessel. The means to be used for the correction of this deviation have received the attention of many skilful investigators. The limits of this article will hardly allow a discussion of the matter which may be found in special books noted at the end.

The contrast between the state of knowledge regarding magnetism before 1600 and its present development is one of the most striking indications of the growth of scientific investigation. Instead of vague speculations, partial truths veiled in mysticism, more or less direct references to dogma and the supernatural, we have organized knowledge based on experience and constantly checked by experiment and ap-

plication. The number of those who believe in "magnetic" healing or, that, because an iron pipe driven in the earth shows polarity, the water flowing through it is magnetic and has special medicinal virtues, is constantly on the decrease. The relations between magnetism and other fields of physical research cannot be treated in this article, yet it may be well to mention that such relations are constantly being investigated and no one in touch with present developments believes that the end is at hand. And it may well be that the delicately poised magnetic needle in some future interpretation of its countless movements will give us a knowledge of the invisible yet all-pervading agency which governs its fluctuations and lead us to a broader generalization of physical phenomena than we can formulate at present. (See ELECTRICITY, ELECTRO-MAGNETISM, etc.). For the optical effects of magnets in rotating the plane of polarization of light see LIGHT, POLARIZATION.

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MAGNETISM, Animal. See ANIMAL MAGNETISM.

MAGNETITE, or MAGNETIC IRON ORE, native magnetic oxide of iron, Fe_3O_4. It sometimes has part of its iron replaced by titanium or magnesium, and occasionally by nickel. It is very abundant (the production of the United States in 1914 being 1,610,203 long tons, or about 3 per cent of the iron ore production of the country). When pure it constitutes a valuable ore of iron, 72 per cent of its weight consisting of that metal. Magnetite crystalizes in the isometric system, commonly in octahedra, but also in dodecahedra, with striated faces. It also occurs, and very generally, in massive and granular forms. It is black in color, with a metallic or submetallic lustre. It is brittle, and has a hardness of from 5.5 to 6.5; the crystals having a specific gravity of about 5.17. It may be readily distinguished by the fact that it is strongly magnetic. Specimens are found which manifest quite a strong, permanent magnetic polarity, this variety of the mineral being known as "lodestone." Magnetite occurs in vast beds in Canada and in the northern and eastern parts of the United States. Abundant deposits of it are also known in California and Washington. It is a common result of segregation in magmas during cooling. See IRON ORES; MAGNETIC SEGREGATION.

MAGNETO, a device, consisting essentially of a magnet and interrupter, for sending sparks into the ignition system of an automobile. The Eisemann, Bosch and Splitdorf are well-known types. See AUTOMOBILE.

MAGNETO-ELECTRIC MACHINES. See ELECTROTHERAPEUTICS.

MAGNETO-ELECTRICITY. See ELECTRO-MAGNETISM.

MAGNETOMETER, in its customarily restricted sense, an instrument employed in observatories to determine the intensity of terrestrial magnetism. Essentially the instrument consists of a magnetic needle free to swing in a horizontal plane within a circular scale. The magnet may be supported on a fine vertical pivot, or by suspension on a fine untwisted silk thread. Bifilar suspension is more to be depended upon; the magnet is supported by two parallel threads and screws enable the tensions in the threads to be equalized and their distance asunder to be adjusted. For delicate readings the instrument has been highly refined, a mirror being attached to the magnet, reflecting a beam of light upon a scale. To prevent possible oscillations due to air currents the magnet is enclosed within a box with glass sides, through which it may be observed. A tall tube above the box encloses the suspending thread. The unifilar magnetometer is set up with its magnet lying in the direction of the magnetic meridian. The bifilar instrument is set with the magnet at right angles to that meridian — a much more sensitive position. To fill the needs of traveling observers, portable magnetometers have been devised. These are more comprehensive, comprising within a single unit an astronomical telescope with a magnetometer—for the determination of both the magnetic declination and the horizontal intensity; and also a dip circle for the determination of inclination and total intensity. Consult *Terrestrial Magnetism*, Vol. XVI, page 1, 'Two New Types of Magnetometers'; and Vol. XVIII, page 105, 'Description of the CIW (Carnegie Institution, Washington) Combined Magnetometer and Earth Inductor' (September 1913). See MAGNETISM — *Terrestrial.*

MAGNIFICAT. The words which Mary pronounced when she visited Elizabeth (Luke i, 46–55) begin, *Magnificat anima mea dominum* ("My soul doth magnify the Lord"). Hence the whole of her thanksgiving on this occasion has been called the Magnificat. The present usage of the Roman Catholic Church is to chant or pronounce the Magnificat every day at vespers.

MAGNOLIA, Ark., town, county-seat of Columbia County, on the Louisiana and Northwest and the Saint Louis Southwestern railroads, about 150 miles southwest of Little Rock. It is in an agricultural and lumbering region. Considerable cotton and fruit are raised in the vicinity. It has a large trade in lumber, fruit, cotton, cottonseed products, corn, oats and potatoes. Its chief buildings are the county buildings, the schools and churches. It is also the seat of the State agricultural college. Pop. 2,045.

MAGNOLIA, a genus of ornamental, deciduous or evergreen trees and shrubs of the family *Magnoliaceæ*. The 35 species are natives

mostly of the United States, India, China and Japan. They are characterized by large, alternate entire leaves, large white, purple or pink, sometimes yellowish, solitary, terminal flowers, which are often highly fragrant; and cone-shaped, often red, decorative fruits. They are widely planted for ornament in parks and gardens; most of the deciduous species being tolerably hardy as far north as Massachusetts, some even farther north, but the evergreen kinds tender even at Washington, where, however, one species (*M. grandiflora*) can withstand the winters if in protected situations. The wood is close-grained, generally soft, spongy, light and satiny. It is little used because it is not durable, but in Japan one species (*M. hypoleuca*) is used for lacquering. The bark and the fruits of a few species were formerly employed as stimulants and tonics, but have fallen into disuse.

As a rule, magnolias thrive best in rather rich, fairly open, moist, peaty or sandy loams, but generally prove satisfactory upon any garden soil. A few, especially the beaver tree (*M. glauca*), which is also popularly known as sweet, swamp or white bay, are natives of very wet grounds and must be naturally well supplied with water, when planted for ornament. They may be propagated by means of layers, by grafts or by seeds planted as soon as ripe or stratified in sand and kept out of doors where they cannot become dry. The plants should be transplanted when the new growth is commencing, otherwise the operation is frequently unsuccessful.

The following species are among the most generally planted in the United States. The bull bay or big laurel (*M. grandiflora*) is found naturally from North Carolina to the Gulf States. It is a pyramidal, evergreen tree which often attains heights of 75 feet or more, and is especially conspicuous when in blossom, its fragrant white flowers often attaining a diameter of a foot. The swamp sassafras or sweet bay (*M. glauca*) ranges from the coast region of Massachusetts to Florida and irregularly southwestward to Texas. It reaches a height of 20 feet and bears fragrant cream-colored flowers. The cucumber trees (q.v.) are natives of the southeastern United States and are particularly attractive because of their pink fruits. Of the exotic species the yulan (*M. denudata*), a native of China, where it has been cultivated for more than a thousand years, and *M. coco*, *M. liliflora* and *M. hypoleuca* are popular, the first and last particularly. By crossing, hybridizing and selection a large number of choice horticultural varieties have been produced.

MAGOFFIN, mą-gŏf'in, **Beriah,** American statesman: b. Harrodsburg, Ky., 18 April 1815; d. there, 28 Feb. 1885. He was graduated from Centre College (Danville, Ky.), in 1835, from the law school of Transylvania University (Lexington, Ky.) in 1838, entered the practice of law at Jackson, Miss., in 1839, but in the same year returned to Harrodsburg. In 1840 he became police judge, in 1848, 1856 and 1860 was a delegate to the Democratic national conventions, in 1850 was elected to the State senate of Kentucky and in 1859–62 was governor of Kentucky. He refused, 15 April 1861, to comply with Lincoln's call for 75,000 troops; in May 1861 by proclamation warned both the Confederate and Federal governments against occupying Kentucky soil, and the citizens of the State against entering hostilities; and in August requested Lincoln to withdraw United States troops. He vetoed a resolution of the legislature directing him to proclaim the evacuation of Kentucky by the Confederates; but the resolution was passed over his veto. In August 1862 he resigned his office and in 1867 was elected to the lower house of the State legislature.

MAGOG, mā'gŏg, Canada, town in Stanstead County in the province of Quebec, on Lake Memphremagog at its outlet, and on the Canadian Pacific Railroad, about 19 miles southwest of Sherbrooke. It has regular daily communications with Newport and other places in Vermont. Its industries include textile prints, lumber and butter and cheese making. Magog is a favorite resort for anglers. Pop. about 4,000.

MAGOG. See GOG AND MAGOG.

MAGOON, mă-goon, **Charles E.,** American lawyer and administrator: b. Steele County, Minn., 5 Dec. 1861. He was educated at the University of Nebraska, was admitted to the bar in 1882 and engaged in the practice of law at Lincoln, Neb., in 1882–99. He was appointed judge-advocate of the Nebraska National Guard, with rank of major, and in 1899–1904 he was law officer of the Bureau of Insular Affairs at the War Office. He served as general counsel for the Isthmian Canal Commission in 1904–05, and was a member of the commission in 1905–06. He was governor of the Canal Zone from 25 May 1905 until 12 Oct. 1906. He was also Envoy Extraordinary and Minister Plenipotentiary to Panama from 7 July 1905 until 12 Oct. 1906. He acted as provisional governor of Cuba from 12 Oct. 1906 until 28 Jan. 1909. Author of 'The Law of Civil Government Under Military Occupation' (1902).

MAGOT. See BARBARY APE; MACAQUE.

MAGPIE (originally *pie,* the pied or variegated bird, a bird of the genus *Pica,* closely related to the jays. The genus is distinguished by the extremely long wedge-shaped tail, the middle feathers of which equal the entire length of the head and body, while the outer feathers are less than half as long. The notorious magpie of Europe (*P. rustica*) is represented in North America by the variety *hudsonia,* which is rather larger but otherwise similar. The color is a lustrous black with a varied and changing iridescence and sharply contrasting white under parts and patches on the shoulders and wings, the latter being conspicuous as the bird flies. The yellow-billed magpie (*P. nuttalli*) of California is precisely similar except that the bill and a naked area at its base are yellow instead of black. Other species inhabit Asia and Africa. In America the common magpie is confined to the west, its range reaching from Alaska to Arizona and from the plains to the Cascade Mountains, being especially common in the Rocky Mountains. The magpie is a handsome bird of saucy, vivacious habits and is chiefly noted for its thieving habits and general rascality. It is always engaged in mischief, either in stealing brightly colored or glittering objects from the habitations of man or in robbing the nests of other birds, but because of its pert, merry manner is

usually forgiven for the former class of offenses. The caged birds seen in the East give but a faint idea of the beauty and activity of these birds in the wild state. Like the jays the magpies are omnivorous, but are less strictly arboreal than they. The nest, which is built in a tree or bush, is very ingeniously and substantially constructed. It is a large domed structure protected outwardly by a thick, bristling layer of thorns and twigs, through which a narrow passage opening on one side leads to a deep cup plastered with mud and lined with fibres. Six to nine greenish drab eggs, much spotted and dashed with various shades of brown, are laid. The American magpie is occasionally taken young and made a pet, but it has not the reputation for talking and amusing, albeit thievish, manners, which has made the European bird a favorite from ancient times. Descriptions of its many interesting habits will be found in the books of Coues, Ridgway, Merriam, Cooper, Keyser and other writers upon the ornithology of the western United States.

MAGRATH, mą-grăth, **Andrew Gordon,** American Confederate governor: b. Charleston, S. C.; d. there, 9 April 1893. Magrath was the son of an Irish revolutionist of 1798 who escaped to South Carolina. He was educated at South Carolina College (1831) and at the Harvard Law School. He served two terms in the State legislature (1840–44), practised law in Charleston and in 1856 was made Federal district judge by President Pierce. In 1861 he resigned, was elected to the South Carolina convention which adopted the ordinance of secession and was then appointed Confederate judge. In December 1864 he became governor of South Carolina. After the war he was imprisoned for several months. He later resumed the practice of law in Charleston.

MAGRATH, William, American painter: b. Cork, Ireland, 20 March 1838. He emigrated to the United States in 1855, and was elected National Academician in 1876. He has produced many excellent landscapes and his genre pictures are full of character. Among them may be mentioned 'The Road to Kenmair' (1871); 'The Reveillé' (1873); 'Rustic Courtship' (1877); 'On the Old Sod' (1879), which last is in the New York Metropolitan Museum; 'Paddy on his own Land' (1900); 'Sheep Pasture' (1903); 'The Killarney Country' (1910); 'The Bog of Allen, Ireland' (1911); 'Bog Lands' (1913).

MAGRUDER, mą-groo'dėr, **John Bankhead,** American soldier: b. Winchester, Va., 15 Aug. 1810; d. Houston, Tex., 19 Feb. 1871. He was graduated at West Point in 1830, served for a short time in the 7th Infantry, then in the artillery. In 1836 he was made first lieutenant, saw service in the Seminole War 1837–38 and became captain in 1846. He took an active part in the Mexican War, rising to the rank of lieutenant-colonel, 1847. In 1861, while in garrison at Washington, D. C., he resigned from the United States army, accepted a Confederate colonelcy and commanded the artillery at Richmond. In the same year he won the battle of Big Bethel (q.v.), and was made brigadier-general and major-general. Assigned to the Yorktown district, he fortified the Peninsula and with a force of 12,000 held it against the Army of the Potomac in April 1862. In the Seven Days' Battles (q.v.) he commanded the Confederate left. In October 1862 he was appointed commander of the Department of Texas. He recaptured Galveston 1 Jan. 1863, and broke the blockade of that port. After the war he served as major-general in the army of Maximilian in Mexico until the end of the empire, but finally in 1869 he settled at Houston for the rest of his life.

MAGRUDER, Julia, American novelist: b. Charlottesville, Va., 14 Sept. 1854; d. Richmond, Va., 9 June 1907. Her literary career began in 1885 with 'Across the Chasm,' published anonymously. She wrote 'A Magnificent Plebeian'; 'The Violet'; 'Miss Ayr of Virginia'; 'A Manifest Destiny'; 'Princess Sonia' (1895), etc.

MAGUAGA, Battle of. See DETROIT, SIEGE AND CAPTURE OF.

MAGUINDANAO, mă-gēn-dā'now, a tribe of Moros who inhabit the valley of the Rio Palangui, island of Mindanao; the Moros of the Sarangani Islands, and some of those of Davao Bay belong also to this group. See PHILIPPINE ISLANDS.

MAGYAR MUSIC. See HUNGARY, *Music.*

MAGYARS, mŏ'gyŏrz, the original name of the Hungarians, which they still use in preference to any other. See HUNGARY.

MAHA-KAŚYAPA, mă hă' kăsh'yă pă, **Kassappa,** one of Buddha's first converts and one of his 80 great disciples who was favored by Buddha as his successor. After the death of Buddha he seems to have taken an active part in the work of organizing and propagating the faith. It was at his instance that the first Buddhist council of a general nature assembled. He gave considerable attention, according to tradition, to the organization and arrangement of the canonical books of the Buddhist faith. Playing such a prominent part at the dawn of the Buddhist religion, and being the beloved and trusted disciple of the master and, in a sense, his successor, it is natural that he should enter largely into the legendary and traditional religious lore of the Buddhists, as he does, in fact. Consult Bournouf, 'Indroduction à l'histoire du buddhisme indien' (Paris 1844); 'Le lotus de la bonne loi' (Paris 1852); Kern, 'Manual of Hindu Buddhism' (Strassburg 1896); Rhys, Davids, 'Buddhism' (London 1890).

MAHÂBHÂRATA. The name of this, the great national epic of the Hindûs, etymologically considered, consists of the word "mahâ," meaning "great," "mighty," and "bhârata," one of the several names of a powerful Indian tribe, but has reference more to the story itself, about "the great tale of the Bhâratas." In the shape in which the Mahâbhârata has come down to us it is enormous in bulk, comprising some 100,000 *çloka* (couplets), and as its author is cited one Vyâsa. But the word "vyâsa" stands for "reviser," "collector," "editor," and this alone, irrespective of the fact that no description, no biographical detail of this Vyâsa has existed, seems clearly to prove that the Mahâbhârata represents a gradual growth and gathering of poetic material finally given a collective name and figuring as an entity. In the poem itself the number of *çlokas* (distichs) is given at 24,000, while there is

rather strong literary proof that the original core was even much smaller than that, namely, counting but 7,000 *çlokas*. The total of the colossal remainder represents accretions and superimpositions that were at last included in the whole — many episodes, much legendary lore, lengthy and detailed ethical precepts, such as those addressed to the Kshatrias, the warrior caste, to guide their behavior to the other castes, and other material. Already in the 4th century A.D. the 'Mahâbhârata' was popularly held in the light of a code of laws as well; it was not alone the 'Iliad' and 'Odyssey' of the Hindû people combined, which youth studied and recited and learned by heart, but also a compendium of morals read aloud by the priests in the temples and shrines, at least fragments and selections from it. Thus we do know that the 'Mahâbhârata' is a work of great antiquity; but the exact period of its birth, the whole story of its genesis, we cannot even guess. It is certain, however, that the kernel of the epic, describing the war between the Kurûs (or Bhâratas) and the Pândavas, must have antedated the time of Kalidâsa by many centuries. The archaic language shows that. This simple tale gives us as heroes Duryôdhana, son of blind King Dhirtarâshtra, Drôna, Kama, Çalya among the Kurûs, and among the Pândavas the five sons of Pându, Ardjuna, Judishthira, Bhima, and the Vishnuic incarnation, their wise counselor, Krishna, the ruler of Yâdava, the "spinner of all ruses and deceptions." The circumstance that the five Pândava brothers have jointly but one wife, Drâupadi, and the fact that the caste, marriage and inheritance customs, as exemplified in the poem, are in strong contrast with later practices, of itself bespeaks great antiquity of this, the core of the epic. Brahmanism had not yet crystallized when it originated. At very different periods extraneous matter has been interpolated and amalgamated with this primary portion of the Mahâbhârata. In fact, all that ran riot in the earlier Hindû mind in the shape of folklore, legend and myth was, one after the other, added to the first text and gradually coalesced with it. Hence, too, the enormous size of this lay as we have it now. But even as it is, the Mahâbhârata is by no means a unit accepted by all. We see it subdivided in the north of India into 18 books (*Parvans*), sometimes including the 19th, the Harivamça; in the south it exists in 24 books, and the various chapters differ materially in sundry versions, both in text and size. The most comprehensive and enlightening critical work in this line has been done by the Danish philologist, Söre Sörensen, in his compendium on Hindû literature (Copenhagen 1843). A careful examination of the whole text unavoidably betrays the mixed origin of the Mahâbhârata, shows plainly the earmarks of having been worked over, revamped, added to, and that numberless scribes have probably been busy at this task for a period exceeding 10 or 12 centuries. The composite character of the poem is also shown by the different metres, contents and spirit. By some scholars, such as Hopkins and Dahlmann, the conclusion has been reached that there were earlier portions of the epic than now remain; perhaps, as Grierson holds, describing an initial struggle for the possession of northern India between the Aryan settlers and their foes. As it stands at present the poem — meaning its oldest core — is somewhat puerile, since it starts with an account of a gambling match, at which the Kurûs cheated the Pandûs, robbed them of the kingdom, and exiled them for 12 years. While spending this exile in the forests and groves, tales are told to while away the dreary hours. When the exile draws to a close the Kurûs are utterly routed during an 18 days' battle. This story furnishes the backbone; it is crude and in a literary sense sadly deficient, but it doubtless derives from the hoary past. The 20,000 stanzas of rules and instructions to the warrior caste are jumbled, often contradictory. From an artistic point of view the best parts of the whole are episodes like that of Damayânti and Nâla, of Savitri, etc., which have been successfully dramatized. Like all of Hindû literature, even the best, there is a palpable lack of proportion. But there are eminently strong passages, scattered here and there in the whole and showing pathos, tenderness, descriptive powers. The student may be referred to a good summary of the poem, 'Mahâbhârata, the Epic of Ancient India,' condensed into English verse by Romesh Dutt (London 1898), to 'Geschichte der indischen Literatur' (Leipzig 1908), by M. Winternitz; to 'Das Mahâbhârata' (Kiel 1892–95), by Adolf Holtzmann; or to the English translation of the original work by a Hindû scholar, Protap Chandra Roy (Calcutta 1883).

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MAHADEVA, mą-hă-dā'vą, in Hindû mythology, a deity who shares the attributes of Siva in the Indian Trinity, Mahadeva being regarded as a generator as well as a destroyer.

MAHAFFY, mą-hăf'ĭ, **John Pentland**, Irish Greek scholar: b. Chapponaire, near Vevay, Lake Geneva, Switzerland, 12 July 1839; d. Dublin, Ireland, 1 May 1919. He was educated in Germany and at Trinity College, Dublin, from which he was graduated in 1859; and became professor of ancient history in the college in 1871. In 1873 he was Donnellan lecturer. His first publication was a translation of Kuno Fischer's 'Commentary on Kant' (1866); and on philosophical subjects he has since issued several volumes. The greater number of his works, however, treat of the history, literature and everyday life of ancient Greece, among these being the following: 'Prolegomena to Ancient History' (1871); 'Greek Social Life from Homer to Menander' (1874); 'Greek Antiquities' (1876), a work much used in Continental schools; 'Rambles and Studies in Greece,' a record of antiquarian research (1876); 'Old Greek Education' (1879); 'History of Classical Greek Literature' (1880; 3d ed., 1891); 'Greek Life and Thought from Alexander to the Roman Conquest' (1887), a continuation of the work of 1874; 'The Greek World under Roman Sway' (1890), a continuation of the preceding; 'The Story of Alexander's Empire' (1890); 'Greek Pictures' (1890); and 'Problems in Greek History' (1892); 'The Progress of Hellenism in Alexander's Empire' (1905); 'The Silver Age of the Greek World' (1906); 'What have the Greeks done for Modern Civilization?' (1909). He writes with special interest and authority of the post-Alexandrian period; and has discovered interesting parallels between that and modern civilization. Among

his other writings are 'Twelve Lectures on Primitive Civilization' (1868); 'Report on the Irish Grammar Schools' (1880–81); 'The Decay of Modern Preaching' (1882), and 'The Art of Conversation' (1889); 'An Epoch in Irish History' (1904).

MAHALEB, a kind of European cherry (*Cerasus mahaleb*), whose fruit affords a violet dye and a fermented liquor. Its flowers and leaves are used by perfumers, and its wood by cabinet-makers. See CHERRY.

MAHAN, mą-hăn', **Alfred Thayer**, American naval officer: b. West Point, N. Y., 27 Sept. 1840; d. 1 Dec. 1914. He was graduated from the United States Naval Academy in 1859, and served during the Civil War, rising to the rank of lieutenant-commander in 1865. In 1885 he was promoted captain, and in 1886 was appointed president of the Naval War College at Newport, a position which he held till 1888, and again 1892–93. In 1893–95 he was commander of the *Chicago*, and in 1896 was retired after 41 years' active service at his own request. In 1898 during the war with Spain he was a member of the Naval Board of Strategy; and in 1899 one of the United States delegates to The Hague Peace Conference. In 1906 he was advanced to the rank of rear-admiral on the retired list. In 1890 he published his chief work, 'Influence of Sea Power upon History'; the continuation, 'Influence of Sea Power upon the French Revolution and Empire,' appeared in 1892; his other writings include 'The Gulf and Inland Waters' (1883); 'Life of Admiral Farragut' (1892); 'Life of Nelson' (1897), highly commended by English critics; 'The Interest of America in Sea Power' (1897), a compilation of his magazine articles; 'Lessons of the War with Spain' (1899); 'The Problem of Asia' (1900); 'The South African War' (1900); 'Types of Naval Officers' (1901); 'Retrospect and Prospect' (1902); 'Seapower in its Relations to the War of 1812' (1905); 'Some Neglected Aspects of War' (1907); 'From Sail to Steam' (1907); 'Naval Administration and Warfare' (1908); 'The Harvest Within' (1909); 'The Interest of America in International Conditions' (1910); 'Armaments and Arbitration' (1912); 'Major Operations of the Navies in the War of American Independence' (1913).

As a historian he made a distinct contribution to historical science as the first writer to demonstrate the determining force which maritime strength has exercised upon the fortunes of individual nations, and consequently upon the course of general history. Technically, his representative work, the 'Influence of Sea Power upon History,' is but a naval history of Europe from the restoration of the Stuarts to the end of the American Revolution. But the freedom with which it digresses on general questions of naval policy and strategy, the attention it pays to the relation of cause and effect between maritime events and international politics, and the author's literary method of treatment, place this work outside the class of strictly professional writings and make it a recognized leading authority. His prime object, in establishing the thesis that maritime strength is a determining factor in the prosperity of nations, was to reinforce his argument that the future interests of the United States require a departure from the traditional American policy of neglect of naval-military affairs. Captain Mahan was president of the American Historical Association in 1902–03; and received honorary degrees from several universities, including D.C.L. from Oxford and LL.D. from Cambridge (England), Harvard, Yale, Columbia and McGill universities.

MAHAN, Asa, American Congregational clergyman and educator: b. Vernon, N. Y., 9 Nov. 1800; d. Eastbourne, Sussex, England, 4 April 1889. He was educated at Hamilton College, Clinton, N. Y., and Andover Theological Seminary, and after holding pastorates at Pittsford, N. Y., and Cincinnati, Ohio, was president of Oberlin College 1838–50; and also professor of philosophy there. He was president of Cleveland University 1850–56; and of Adrian College, Michigan, 1860–71. After the last-named date he lived mainly in England. Among his works were 'Doctrine of Christian Perfection' (1839); 'System of Intellectual Philosophy' (1845); 'The Will' (1846); 'Science of Logic' (1857); 'Mental Philosophy' (1882); 'History of Philosophy' (1883).

MAHAN, Dennis Hart, American military engineer: b. New York City, 2 April 1802; d. near Stony Point, N. Y., 16 Sept. 1871. He was graduated at West Point in 1824, where in 1825 he was appointed assistant professor of mathematics and of engineering. He was stationed in Europe four years on professional duty and in 1832 returned to West Point as professor of military engineering, where he remained until his suicide, which was caused by temporary insanity. His textbooks are generally recognized authorities and include 'Treatise on Field Fortifications' (1836); 'Descriptive Geometry' (1864); 'Military Engineering' (1865); 'Permanent Fortifications' (1867); 'An Elementary Course of Civil Engineering' (1837, rewritten 1868), etc. Consult Abbot, H. L., 'in Biographical Memoirs of the National Academy of Sciences' (Vol. II, Washington 1886).

MAHAN, Milo, American Protestant Episcopal clergyman, brother of Dennis Hart Mahan (q.v.): b. Suffolk, Va., 24 May 1819; d. Baltimore, Md., 3 Sept. 1870. He was educated at Saint Paul's College, Flushing, L. I., and in 1845 was ordained in the Protestant Episcopal Church. He was called to the charge of Grace Church, Jersey City, N. J., in 1848, and became assistant at Saint Mark's, Philadelphia, in 1850. In 1857–64 he was professor of ecclesiastical history at the General Theological Seminary, New York. He became rector at Saint Paul's, Baltimore, Md., in 1864 and spent the remainder of his life there. Author of 'The Exercise of Faith' (1851); 'History of the Church During the First Three Centuries' (1860; enlarged to cover seven centuries, 1872); 'Palmoni, a Free Inquiry' (1864); 'The Comedy of Canonization' (1868); 'Collected Works' (3 vols., 1872–75).

MAHANADI, mä-hä-nŭd'ĭ, or **MAHANUDDY** ("The Great River"), a river in British India. In the upper part of its course it drains the fertile plain of Chhattisgarh in the Central Provinces; flows southeast and then east through the province of Orissa, past Sambalpur and Cuttack, into the Bay of Bengal by two mouths, after a course of about 530 miles.

During the rains it is navigable 30 miles from its estuary, but a large portion of its channel is dry during five or six months of the year, and since the opening of the Bengal and Nagpur Railroad it has been little used for navigation. It is estimated that the Mahanadi drains an area of nearly 44,000 square miles, and during the rainy season about 1,500,000 cubic feet of water passes every second through the Maraj gorge, which amount decreases in dry weather to 1,125 cubic feet. An extensive system of irrigation canals is connected with it. Diamonds are found in this river and in several of its tributaries.

MAHANOY (mā-hạ-noi') **CITY**, Pa., borough, in Schuylkill County, on Mahanoy Creek, and on the Lehigh Valley and the Philadelphia and Reading railroads, about 55 miles northeast of Harrisburg. The first settlement was made in 1859, and it was incorporated in 1863. It is in the anthracite region, and in the vicinity is fire-clay and an excellent building-stone. Its chief manufactures are pottery, foundry products, flour, hosiery and lumber. In the vicinity are many collieries, all of which are operated by residents of Mahanoy City. The trade is principally in coal, pottery and lumber. The city has excellent public and parish schools and a number of fine churches. Pop. 15,936.

MAHARAJAH, mạ-hā-rā'jạ, a title used in India; applied in courtesy to every rajah, or to any person of high rank or deemed holy.

MAHASEER, mā'hạ-sēr, a large and ravenous barbel (*Barbustor*) of India, which reaches six feet in length and in the early part of the rainy season afford the best sport known to the anglers of India and Ceylon, as they take a fly readily, and struggle with the gameness and energy of a salmon to get free, pleasantly taxing the skill of the angler to bring them to land without breaking rod and line. They spawn at the heads of the hill-rivers, and then descend before the young are hatched. The fry then have an opportunity to grow in comparative safety to a size which enables them, the following season, to descend the rivers and take care of themselves; otherwise they would be devoured in infancy by their elders.

MAHATMA, a Hindu word meaning "the great-souled one," and applied among the Brahmans to one who has attained the highest possible point of spiritual enlightenment. It is also the name of a high priest or "wise leader" of the theosophists

MAHĀYĀNA ("The Great Vehicle"), the name of one of the principal divisions of Buddhism (q.v.). It originated in northern India about the beginning of the Christian era through a gradual synthesis of tendencies already manifest in earlier Buddhism, possibly with some admixture of ideas from the West.

In its philosophy the Mahāyāna goes beyond primitive Buddhism's denial of the real existence of a soul or ego, and maintains the doctrine of the utter unreality of all experience. This is expressed in the formula "everything is void," which is interpreted by the Madhyamaka, or sceptical, school as meaning that it is impossible either to affirm or to deny anything concerning reality, whereas the Vijnānavādins, or idealists, declare "the void" to be pure thought, without distinction of subject or object. Both schools admit that the illusion of the phenomenal world is invincible for even the wisest man, and that only the Buddhas are perfectly free from it, so that the practical validity of experience is not impaired.

The idea of the Buddha, or "Enlightened One," has received a great extension in the Mahāyāna, and the human traits of the historic Gautama have been lost in the radiance of divinity. There are countless Buddhas throughout the worlds, and they manifest themselves through infinite periods of time in the various heavens, as well as by appearing on earth in the guise of human teachers. In their function of enlightening all creatures they are aided by the celestial Bodhisattvas, or Buddhas-to-be, who are more actively beneficent. Among the Buddhas the most worshiped is Amitābha, "He of Boundless Light," the ruler of the Western Paradise called Sukhāvatī, "Happy Land." This deity, who is quite unknown in the earlier Buddhism, is presumably of solar origin. The merciful Avalokiteśvara and Manjuśrī, the fount of wisdom, are especially prominent Bodhisattvas. The belief in female Bodhisattvas, such as Tārā and the Chinese Kwan-yin, is a later development, as is also the notion of a "primordial Buddha," or First Cause. All this luxuriant polytheism is harmonized with the doctrine of "the void" through the belief that a Buddha has three "bodies" or modes of being, the "body of the Law," identical with the void, the "body of bliss," an appearance manifested to the celestial beings, and the "body of fabrication," the illusory form of an earthly Buddha such as Gautama.

The Mahāyānist belief in the powerful and merciful Buddhas and Bodhisattvas is accompanied by a new conception of the religious life. Instead of the older self-centred system of monastic discipline, by which the individual was to obtain final deliverance, Nirvāna, at the close of his present existence, the Mahāyānists made it their goal to become Buddhas themselves, after practising all the virtues through numberless existences, for the sake of the salvation of all beings. Everyone who consecrates himself to this aspiration is a Bodhisattva, or potential Buddha, although he will not attain the rank of a celestial Bodhisattva until toward the last of the 10 stages in his career. Self-sacrifice, rather than self-restraint, is therefore the keynote of the ethics of the Mahāyāna, and though the institution of monasticism is preserved, the discipline is relaxed, and laymen also may follow the career of a Bodhisattva. Prayer and confession of sins to the Buddhas are commanded, and forgiveness is believed to be secured through their superabundant merits.

The broadly human quality of the Mahāyāna religion involved a certain sacrifice of the distinctive features of Buddhism, and its later development, particularly in the form of the Tantra (q.v.) system, shows a gradual approximation to the contemporary Hinduism. Hence in India the Mahāyāna ultimately gave way to the Vedānta philosophy and the popular religions of Vishnu and Siva; but it still survives in the countries to the north and east, whither it had been carried by missionary activity. In Tibet and Mongolia it has assumed the form of Lamaism (q.v.), while in China and Japan it shows more of its primitive character, although

in the latter country especially it has split into numerous sects, some of which hold a decidedly theistic belief.

Bibliography.— The sacred books of the Mahāyāna are very numerous and are still imperfectly known. Among those accessible in translations are 'The Lotus of the True Law' (trans. by H. Kern in 'Sacred Books to the East,' Vol. XXI, 1884); various shorter texts in the same series (Vol. XLIX, part 2, 1894); Sāntideva's 'The Path of Light' (trans. by L. D. Barnett, 1909); 'The Awakening of Faith,' sometimes ascribed to Aśvaghosha (trans. by T. Suzuki, 1900). Consult also Poussin, L. de la Vallée, 'Bouddhisme: opinions sur l'histoire de la dogmatique' (1909); Suzuki, D. T., 'Outlines of Mahāyāna Buddhism' (1907).

CHARLES J. OGDEN.

MAHDI, mä'dē. See MAD MULLAH.

MAHÉ, mä-hā', Indian Ocean, the largest island of the Seychelles Archipelago, belonging to Great Britain. It is 17 miles long by 4 miles broad, has an area of 55½ square miles and attains an elevation of 2,000 feet above sea-level, from which it rises in most places nearly perpendicularly. It contains Victoria, the administrative seat, and a coaling station with a good harbor. Pop. 20,000. See SEYCHELLES.

MAHHOL. See MACHOL.

MAHI KANTHA (mä'hē kän'thą) **AGENCY,** India, a group of native Gujerat states, administered since 1820 by a British political agent of the province of Bombay. The chief state, Idar, occupies about one-half of the combined area of 3,125 square miles. There are 11 other states of much importance. The climate is fair, April and May being the hottest months, and January the coolest. The average annual rainfall at Idar is 34 inches. About one-fourth of the area is capable of cultivation. During the famine of 1899–1900 a great number of the people perished. Pop. about 375,000, consisting largely of wild Bhil and Khoil tribesmen.

MAHICAN, mä-hīk'an (meaning «wolf»), an Algonquin tribe of American Indians formerly occupying the Hudson River Valley. They were closely related to the Delawares and the Mohegans, the collective tribes being known as the *Loup* or Wolf Indians. At one time there was a settlement of 40 villages near the site of the present city of Albany. The assaults of the Iroquois and the white settlers diminished the tribe until the remnants of the race became merged with the Delawares. In 1736 those who still remained in Massachusetts, whither they had removed some years before, came together as a unit at Stockbridge and assumed the name of Stockbridge Indians. Later they removed to New York, but now, together with a part of the Munsee, they are located upon a reservation near Green Bay, Wis.

MAHMUD (mä-mood') **I,** or **MOHAMMED,** Turkish sultan: b. Constantinople 1696; d. 1754. He was the son of Mustapha II and succeeded his uncle Achmet III in 1730. He was a well-disposed but incapable monarch and his reign is of little importance. See MOHAMMED.

MAHMUD II, Turkish sultan: b. 20 July 1785; d. 1 July 1839. He was the second son of Abd-ul Hamid I, and under the reign of his uncle Selim III he received an education exceptionally broad for a prince of his station. He succeeded his brother Mustapha in 1808 and organized his government on a reform basis. He conducted a war against Russia and Serbia until 1812, when by the Treaty of Bucharest Moldavia and a greater part of Wallachia were restored to the Ottoman government, even though the Russian frontier was somewhat advanced. He subjected the Wahabees and quelled the insurrection of Ali Pasha of Jannina in 1822. In his war with the Greeks he incurred the intervention of the powers with disastrous results to his forces and by the Treaty of Adrianople (q.v.) he was obliged to yield so much that his power was greatly weakened. Mahmud was a progressive monarch, he introduced modern ideas of warfare, a regular police system and founded schools. Against serious obstacles he crushed the janissaries, but a second rebellion of Mehemet Ali in 1839 was followed by a defeat which shortly preceded the broad-minded monarch's death.

MAHMUD, sultan of Ghazni, the founder of the Mohammedan empire in India: b. Ghazni, about 970; d. 29 April 1030. His father, Sabuktagin, governor of Ghazni, owed a nominal allegiance to Persia, but was really independent. On his death Mahmud put aside his brother Ismail, whom his father had appointed to succeed him, took the title of sultan, then overthrew the Persian monarchy, and laid the foundation of an extensive empire in central Asia. He then turned his attention to India, which he invaded repeatedly. His earlier expeditions into the country were directed against successive rajahs of Lahore, on whom he inflicted repeated defeats. In 1008 the Rajah of Lahore, Anangpal, with the assistance of a powerful coalition of rajahs, had assembled one of the largest armies yet seen in the Punjab, but Mahmud was again victorious and carried away enormous spoils from the temple of Nagarcot. On his return he celebrated a triumph at Ghazni. In 1010, after subduing Ghur in the Hindu-Kush, he resumed his conquests in India, captured Multan, plundered the temple of Tanesar and continued for a number of years to extend his conquests in successive expeditions. These for a time were interrupted by his conquest of Transoxiana, effected in 1016. In 1017 he set out at the head of an army of 100,000 foot and 20,000 horse, passed the Jamna Jummd and turning to the south appeared before Canoj, the largest and most magnificent Indian city of the day, the rajah of which took precedence of all the Indian rajahs. As the Rajah of Canoj at once submitted it was spared from pillage, a fate to which Mattra, a famous religious city, was subjected without restraint for 20 days. In 1023 he annexed the territories of Ieipal II who had revolted and established for the first time a permanent Mohammedan garrison in Lahore. His last, which is usually called his 12th, expedition into India (1024–26) was directed against Gujerat. He took the capital and changed the government, but the chief attraction was Somnáth. The magnificence of its temple filled him with wonder and the descriptions of it suggest images of the palace of Aladdin. Its lofty roof was supported by 56 pillars carved and glittering with

precious stones. It was lighted by a lamp suspended from the centre by a gold chain. A huge idol, which Mahmud broke, was found hollow and disclosed immense treasures in diamonds and precious stones. The pieces of the idol were sent to Mecca, Medina and Ghazni. The remainder of his enterprises were confined to western Asia. Mahmud was avaricious and loved to accumulate treasures from his warlike expeditions. Consult Elliot, 'History of India'; Lane-Poole, 'Mediæval India under Mohammedan Rule' (London 1903).

MAHMUD, Shevket Pasha, Turkish soldier and statesman: b. Bagdad 1857; d. 11 June 1913. At 24 he came under the influence of the German general von der Goltz, then reorganizing the Turkish army and by whom he was sent to purchase war material in Germany and France. After 10 years' sojourn in western Europe, Mahmud Shevket returned home with advanced ideas. As governor of the vilayet of Kossovo he threw in his lot with the Young Turk revolution in 1909. The new ministry placed him in command of an army corps at Salonica. He suppressed the counter-revolution in Constantinople and in 1910 became Minister of War until 1912. In January 1913 he was appointed Grand Vizier and War Minister combined, in which capacity he concluded peace with the Balkan League (q.v.). He was murdered while motoring to the Porte.

MAHO, or MAHAGUA. The West Indian names of an important fibre plant, *Hibiscus tiliaceus* or linden hibiscus, lemon hibiscus or corkwood, a member of the mallow family. It is a handsome woody shrub or small tree with large lemon-yellow flowers and entire broadly cordate leaves like linden. Low banks of tidal rivers is its favorite habitat and it is widely distributed over tropical America, Polynesia and the shores of the Indian Ocean. In some of the Pacific islands it grows spontaneously in large areas which have been abandoned after previous cultivation. The bark contains a strong flexible fibre used for many purposes, especially by the aborigines who also used the wood for making fire in the primitive fashion. The dark green heart wood is very tough and durable. The plant has remarkable properties of renewing fertility of soil which has been exhausted by crops. The maho is considered indigenous to America and apparently on account of its useful character it was distributed widely over the islands and shores of the Pacific and Indian oceans before the arrival of Europeans. The etymology of its names in various regions gives some important clues as to the history of its distribution.

MAHOGANY. A popular name for the timber of several unrelated trees, among which are various species of eucalyptus (q.v.), natives of Australia and members of the family *Myrtaceæ;* two species of Cercocarpus, of the family *Rosaceæ, C. montanus* being known as valley mahogany and *C. ledifolius* as mountain mahogany in the Rocky Mountain region where they are native and are mainly used for fuel. African mahogany (*Khya senegalensis*), East Indian mahogany (*Soymida febrifuga*), and *Cedrela toona,* an East Indian tree equally well known also as the toona, all belong to the family *Meliaceæ,* but are less important timber trees than the true mahogany (*Swietenia mahagoni*) of the same family. This species is a native of tropical America, occasional small specimens being found in extreme southern Florida. It was formerly abundant in the West Indies, reaching altitudes of 1,500 feet or more in Jamaica, but on account of the demand it is now scarce. Cuba and Santo Domingo formerly supplied the choicest; Honduras the low grades; now practically all comes from Central America. The wood is generally some shade of brown, fine grained, easily polished and durable except under lateral strain. It is highly valued for furniture, musical instruments, interior house-finishing, etc., and is one of the most popular woods of the world. Formerly it was used for ship-building but now very little. The tree, which sometimes attains heights exceeding 100 feet, and diameters of six feet, has abruptly pinnate leaves with usually four pairs of leaflets, and small white or yellowish flowers in axillary or nearly terminal panicles. As an ornamental tree it is planted in southern Florida and southern California in rich soil. A few other related species of this genus are occasionally found in commerce.

MAHOMET. See MOHAMMED.

MAHOMMEDAN LAW. See MOHAMMEDANISM.

MAHON, mä-hōn', or PORT MAHON (ancient *Portus Magonis*), Spain, city and port, on the island of Minorca, of which it is the capital, at the head of a bay which forms one of the best harbors on the Mediterranean. Fishing, fish-curing, agriculture and stock raising are the chief occupations. In the bay are several rocky islets, on one of which stands an arsenal, on a second a lazaretto and on a third a naval hospital. There are also a fine church, the consistorial palace, a theatre, museum and library. The harbor is strongly fortified. The exports are brandy, wine, dried fruits, agricultural produce, etc.; and the imports, grain, wearing apparel, tobacco, sugar, coffee, cacao, leather, hats and other manufactured goods. Its trade amounts to about $1,000,000 annually. Mahon is believed to have been founded by the Carthaginian general Mago, whence its ancient name. It was occupied by the English in 1708. It was taken from them, after a memorable siege, by the French under Marshal Richelieu on 28 June 1756. Admiral Byng was shot for failing to relieve it. It was restored to the English in 1763; and taken by the Spaniards in 1782. It was retaken in 1798, and finally given to Spain by the Treaty of Amiens in 1802. Pop. 17,542.

MAHONE, mą-hōn', William, American soldier and politician: b. in Southampton County, Va., 1 Dec. 1826; d. Washington, D. C., 8 Oct. 1895. He was graduated at the Virginia Military Institute in 1847, and became a civil engineer and railroad constructor. At the opening of the Civil War he entered the Confederate army; took part in the Peninsular and Rappahannock campaigns, and by bravery at Petersburg acquired the sobriquet "The Hero of the Crater." (See PETERSBURG, MILITARY OPERATIONS AGAINST). In 1864 he was made brigadier-general and major-general. The war over, he accepted the presidency of the Norfolk and Tennessee Railroad, and also became active in politics. He was the principal organizer (about

1878) and leader of the Readjusters (q.v.), chiefly a faction of the Democratic party in Virginia who favored the forcible readjustment of the State debt on terms involving conditional or partial repudiation. Mainly by the supporters of this movement, he was elected in 1880 to the United States Senate, where, however, he acted with the Republicans, making the vote of the Senate a tie and disappointing the Democrats of their expected majority. By this and other acts of his senatorial career he lost favor with his constituents and was not re-elected.

MAHONY, mäh'ō-nī, **Francis Sylvester,** "Father Prout," Irish author: b. Cork 1804; d. Paris, 1866. Educated at a Jesuit seminary at Amiens, he studied theology at Paris, was admitted into the Order of the Jesuits and taught for some time in a Jesuit college in Ireland, but for some irregularities was deprived of the position of a member of the order. He received clerical ordination and officiated for a short time at Cork and in London, but soon adopted the profession of literature. In 1834–36 he contributed the 'Prout Papers' to *Fraser's Magazine*, published as the 'Reliques of Father Prout' in 1836. In 1846 he became Rome correspondent to the London *Daily News*, his letters being afterward republished as 'Facts and Figures from Italy' (1847). In his later years he was Paris correspondent for the *Globe*. The 'Reliques of Father Prout' in a revised and enlarged form were published in 1860, and 'Final Reliques' in 1876. In 1881 Charles Kent published a collective edition with a memoir. He will be longest remembered by his poem 'The Bells of Shandon.'

MAHRATTAS, mą-răt'ąz, a native Hindu race, supposed to be descendants of the Persians, and occupying a large tract of central and western India. They have always been a distinct nation or people, and still consider themselves as such, even though now largely under British or Mohammedan jurisdiction. They came into prominence about the middle of the 17th century, when the chief, Sevaji extended his conquests in various directions, had himself crowned king in 1674 and established the Mahratta Empire. After his death long minorities and the incompetency of the sovereigns caused the powers of the state to fall into the hands of the *Peshwa* or Prime Minister, who became the acknowledged head of a Mahratta confederacy. The first trouble with the British broke out in 1775 and was not settled until 1782. This happened during the administration of Warren Hastings (q.v.). The next outbreak came in 1803–05 and resulted not only in the acquisition of territory by the British but also in strengthening their power. Meanwhile the confederacy had held together till 1795, but internal wars and disturbances reduced the *Peshwa* to the position of a British dependent, and Scindia, Holkar and the Rajah of Berar were able to take the position of independent sovereigns. The confederacy came to a final end in 1818, after the third collision wherein the Peshwa himself took up arms against the British, and Scindia, Holkar, the Guicowar of Baroda, and the Rajah of Kolapore became dependent princes under British protection. The state of Gwalior came under British control in 1844. Though devout worshipers of Brahma, no distinction of caste exists among them. Consult Grant-Duff, 'History of the Mahrattas' (Bombay 1863); Kincaid, C. A. and Parasnis, R., 'A History of the Maratha People' (Vol. I, London 1919); Ranade, 'Rise of the Maratha Power' (ib. 1900); 'Imperial Gazetteer of India' (Oxford 1909).

MAI, Angelo, än'jā-lō mā'ē or mī, CARDINAL, Italian classical scholar: b. Schilpario, near Bergamo, Italy, 7 March 1782; d. Albano, 8 Sept. 1854. His abilities attracted the notice of Father Mozzi, a Jesuit, who instructed him in Latin, Greek and mathematics. On the establishment of a Jesuit college at Colorno, in the duchy of Parma, he accompanied Father Mozzi thither in 1799, and a few years afterward was made professor of Latin and Greek in the Jesuit college at Naples (1804). He was transferred to Milan (1808), where he became an associate of the Ambrosian College, and one of the curators of the Ambrosian Library. One special department to which he devoted himself was the examination of the palimpsests (q.v.) and through his industry in deciphering these, two volumes of fragments of Cicero's orations, of Lysimachus and of Isæus, a fragment of the 'Vidularia' (a lost comedy of Plautus), and a collection of the letters and other writings of Cornelius Fronto, the preceptor of Marcus Aurelius, were recovered and given to the world. In 1819 he was appointed chief keeper of the Vatican Library at Rome, and discovered beneath a manuscript of Saint Augustine's 'Enarrationes in Psalmos' obliterated fragments of Cicero's treatise 'De Republica,' amounting to about a fourth of the original, which he published in 1822 with a critical commentary. A colossal work was then undertaken by Mai, the editing of the various unpublished manuscripts in the Vatican, sacred and profane. It comprises 10 quarto volumes, under the title of 'Scriptorum Veterum Nova Collectio e Vaticanis Codicibus Edita' (1828–38), and consists of numerous fragments, previously believed to be lost, of the ancient historians, such as Polybius, Diodorus Siculus, Dionysius of Halicarnassus, Dion Cassius, Appian and others, besides the various writings of the Fathers. In 1838 he was created a cardinal. A new collection, 'Spicilegium Romanum,' was published in 10 volumes between 1839 and 1844, and a patristic series, called 'Nova Patrum Bibliotheca,' issued between 1845 and 1853, closed his list of publications. Consult his life by G. Poletto (Siena 1887); also Prina, B., 'Biografia del cardinale Angelo Mai' (Bergamo 1882); Sandys, J. E., 'A History of Classical Scholarship' (Vols. I, III, Cambridge 1908).

MAIA, mā'ya, in Greek mythology, the eldest daughter of Atlas and Pleione. She was placed with her six sisters among the stars, where they have the common name of *Pleiades*. The Romans also worshiped a Maia, who was also called *Majesta*, and was afterward identified with the daughter of Atlas. The Tusculans called their principal deity *Majus*. The month of May is said to have received its name from them.

MAID OF ATHENS, immortalized by Lord Byron, was Theresa Macri, who 25 years after Byron's poem was written had lost her beauty, lived in a hovel in dire poverty and had reared a large family.

MAID MARIAN, a name given Matilda, daughter of Fitz-Walter, baron of Bayard and Dummow. She eloped with Robert Fitz-Ooth, an outlaw, and lived with him in Sherwood Forest. It is supposed that she was married by Friar Tuck to Fitz-Ooth, who was more commonly called Robin Hood (q.v.).

MAID OF THE MIST, (1) the name of a small steamboat formerly used on the Niagara River below the Falls, to carry passengers close to the cataract. (2) A name given to the heroine of Sir Walter Scott's 'Anne of Geierstein.'

MAID OF ORLEANS, a name given Jeanne d'Arc (1412–31) (q.v.).

MAIDEN, or **THE WIDOW,** an instrument of capital punishment used in Scotland during the 16th century, the prototype of the French guillotine (q.v.). It consisted of an upright frame and a broad piece of iron a foot or more wide, sharp on the lower part and loaded above with lead. At the time of execution this was pulled up to the top of the frame, in which was a groove on each side for it to slide in. The prisoner's neck being fastened to a bar underneath, on a sign given the cutting iron was let loose, and the head instantly severed from the body. Its first victim is said to have been Thomas Scott, executed 3 April 1565, one of the agents in the assassination of Rizzio. In 1581 it was used in the execution of the Earl of Morton, the alleged inventor.

MAIDEN QUEEN, in England, a popular title bestowed upon Queen Elizabeth.

MAIDENHAIR FERN. See FERNS AND FERN ALLIES.

MAIDENHEAD, England, market town and municipal borough in Berkshire, on the Thames, 24 miles west of London, on the Great Western Railway. It is an ancient town and was formerly known as Maydenhutt, or Maydenhith, and while its stone bridge which takes the London road over the Thames dates only from 1772 there are records of earlier bridges as early as 1297. It was incorporated as a guild to maintain the bridge by Henry VI, in 1451. It had formerly a large carrying trade in malt, meal and timber but it is now principally a residential town and pleasure resort for boating parties. The Wednesday market is still held under the charter of Queen Elizabeth, dating from 1582. Pop. about 15,219.

MAIDSTONE (Saxon MEDWEGESTUN) England, municipal and Parliamentary borough and the county town of Kent, 34 miles east-southeast from London, on the banks of the Medwey. The town consists chiefly of four principal streets, which cross each other at the market-place, with smaller ones branching off at right angles. Its fine old Collegiate Church of All Saints is supposed to be of the 14th century, and is one of the largest parish churches in England. It has historical associations with the rebellions of Jack Cade and Sir Thomas Wyatt, and was stormed by the Parliamentarians under Favifase in 1648. It has excellent educational institutions; schools, libraries, science and art institutions, museums, play grounds and parks. The chief industries are paper-making (for which there are several large mills), brewing, iron founding and the manufacture of agricultural implements. It is the centre of a great hop district. The Medway is navigable for 15 miles above the town. Pop. about 34,000. Consult Cave-Browne, 'Maidstone'; Russell, 'History of Maidstone'; Gilbert, 'The Collegiate Church of All Saints.' Maidstone returns one member to Parliament. Pop. about 35,475.

MAIDU PEOPLE, an aboriginal Pujunan group of Indians of northern California, of which the chief tribe, the Concow, inhabited the region of the Upper Sacramento River. Their descendants are to be found in the Round Valley Reservation. Their communities comprised rough dwelling-places or hogáns built of boards, large circular halls or town-houses for assemblies and ceremonials and wicker storehouses for the winter supply of acorns which with piñons formed their staple food supplies. Their clothing was of the scantiest description; the chief of their numerous dances was the acorn dance; and they had a secret male society in which the initiatory age was 12. Consult Dixon, R. B., 'Maidu' (in Boas, 'Handbook of American Indians,' Washington 1911); id., 'Maidu Texts' (in American Ethnological Society Publications, Vol. IV, Leyden 1912).

MAIGNAN, Albert, ăl-bâr mă-nyän, French painter: b. Beaumont, Sarthe, 14 Oct. 1845; d. Paris, 29 Sept. 1908. He studied at Paris under Nöel and developed a strong and original manner in historical and landscape painting. At the Salon of 1879 he was awarded a first class medal. Amongst the most striking of his pictures are 'Dante's Meeting with the Countess Matilda' (1881) now in the Luxembourg; and 'Assault on Pope Boniface VIII at Anagni' in the New York Metropolitan Museum of Art.

MAIGRE, mā'gẽr, or **MEAGRE,** a large European drum-fish (*Sciæna aquila*), common in the Mediterranean, where it forms one of the most important local food-fishes. It may attain a length of six feet, and its flesh has always been a favorite with epicures. Yarrell says that anciently on account of its large size it was always sold in pieces, and that the fishermen of Rome were accustomed to present the head, considered the finest part, as a sort of tribute to the three local magistrates who acted for the time as the conservators of the city.

MAIL-SHELL. See CHITON.

MAILDUN, mal'doon, **MAELDUIN,** or **MAELDUNE,** hero of Irish romance, 'Voyage of Maildun.' He was the son of Ailill Ocar Aga, of the tribe of Owenaght of Ninus, in County Clare, and before his birth his father was killed by pirates. He grew up handsome and accomplished, but had scarce reached manhood before he set sail with a crew of 60 men to find his father's murderer. For three years and seven months he voyaged on the Western Ocean seeing marvels such as no eyes had seen before. At length he found the murderer of his father, but pardoned him his wrong in gratitude to the great mercy of God who had delivered him from so many perils. Consult Joyce, P. W., 'Old Celtic Romances' (tr. from Gaelic, 3d ed., New York 1898); Tennyson, 'The Voyage of Maeldune.'

MAILLY, William, American Socialistic journalist: b. Pittsburgh, Pa., 22 Nov. 1871; d. 4 Sept. 1912. He was educated in the common schools of Scotland and England, and in 1895–

96 was editor of the Birmingham *Labor Advocate*. He returned to the United States and in 1898 organized the Social Democratic party of New York. He edited the *Social Democrat* at Haverhill, Mass., in 1899–1900; was associate editor of *The Worker* in New York in 1901 and in 1906–07; and managing editor of New York *Evening Call* in 1908–09. He was one of the organizers of Social Democrat, now Socialist, party at Chicago in 1898; organizer and secretary of the Socialist party of Massachusetts in 1902; and in 1905–06 he was a member of the National Executive Committee of the Socialist party.

MAIMON, mī'mŏn, **Salomon,** German philosopher: b. near Mir in Minsk, 1754; d. Siegersdorf, Lower Silesia, 22 Nov. 1800. He was trained for a rabbi, but having become acquainted with the philosophy of Maimonides, he made his way to Berlin, and studied modern philosophy, languages and some science. Besides cultivating his own mind, and teaching a little, he wrote some philosophical treatises and literary hack-work. Yet he had Mendelssohn, the philosopher, among his friends, was admired by Kant and attracted the attention of Goethe. This he owed to his 'Attempt at a Philosophy of Transcendentalism' (1790), in which he set out to supplement Kant's system with truths gleaned for the most part from Spinoza, Leibnitz, Hume, Locke and others. Consult Witte, 'S. Maimon' (Berlin 1876).

MAIMONIDES, mī-mŏn'ĭ-dēz, properly Moses Ben Maimon Ben Joseph (Arabic, Abu Amram Musa ibn Maimun Obeid Allah al Kortobi), Jewish scholar: b. Cordova, Spain, 30 March 1135; d. 13 Dec. 1204. At an early period he developed a taste for the exact sciences and for philosophy. He read with zeal not only the works of the Mohammedan scholastics, but also those of the Greek philosophers in such dress as they had been made accessible by their Arabian translators. In this way his mind, which by nature ran in logical and systematic grooves, was strengthened in its bent; and he acquired that distaste for mysticism and vagueness so characteristic of his literary labors. He went so far as to abhor poetry, the best of which he declared to be false, since it was founded upon pure invention — and this too in a land which had produced such noble expressions of the Hebrew and Arab muse. It is strange that this man, whose character was that of a sage, and who was revered for his person as well as for his books, should have led such an unquiet life, and have written his works so full of erudition with the staff of the wanderer in his land. For his peaceful studies were rudely disturbed in his 13th year by the invasion of the Almohades, or Mohammedan Unitarians, from Africa. They not only captured Cordova, but set up a form of religious persecution which happily is not always characteristic of Islamic piety. Maimonides' father wandered to Almeria on the coast; and then (1159) straight into the lion's jaws at Fez in Africa,— a line of conduct hardly intelligible in one who had fled for the better exercise of the dictates of conscience. So pressing did the importunities of the Almohad fanatics become, that together with his family Maimonides was compelled to don the turban, and to live for several years the life of an Arabic Marrano. This blot upon his fair fame — if blot it be — he tried to excuse in two treatises, which may be looked upon as his "Apologia pro vita sua": one on the subject of conversion in general (1160), and another addressed to his coreligionists in southern Arabia on the coming of the Messiah. But the position was untenable and in 1165 we find Maimonides again on the road, reaching Accho, Jerusalem, Hebron and finally Egypt. Under the milder rule of the Ayyubite caliphs, no suppression of his belief was necessary. Maimonides settled with his brother in old Cairo or Fostat, gaining his daily pittance first as a jeweler, and then in the practice of medicine, the while he continued in the study of philosophy and the elaboration of the great works upon which his fame reposes. In 1177 he was recognized as the head of the Jewish community of Egypt, and soon afterward was placed upon the list of court physicians to Saladin. When he died, his body was taken to Tiberias for burial.

Perhaps no fairer presentation of the principles and practices of rabbinical Judaism can be cited than that contained in the three chief works of Maimonides. His clear-cut mind gathered the various threads which Jewish theology and life had spun since the closing of the Biblical canon, and wove them into such a fabric that a new period may fitly be said to have been ushered in. The Mishnah had become the law-book of the Diaspora; in it was to be found the system of ordinances and practices which had been developed up to the 2d century A.D. In the scholastic discussions in which the Jewish schoolmen had indulged their wit and their ingenuity, much of its plain meaning had become obscured. At 23 Maimonides commenced to work upon a commentary to this Mishnah, which took him seven years to complete. It was written in Arabic, and very fitly called 'The Illumination'; for here the philosophic training of its author was brought to bear upon the dry legal mass, and to give it life as well as light. The induction of philosophy into law is seen to even more peculiar advantage in his 'Mishnah Tōrah' (Repeated Law). The scholastic discussions upon the Mishnah had in the 6th century been put into writing, and had become that vast medley of thought, that kaleidoscope of schoolroom life, known by the name of Talmud. Based upon the slender framework of the Mishnah, the vast edifice had been built up with so little plan and symmetry that its various ramifications could only be followed with the greatest difficulty and with infinite exertion. In turn, the Talmud had supplanted the Mishnah as the rule of life and the directive of religious observance. Even before the time of Maimonides, scholars had tried their hand at putting order into this great chaos; but none of their efforts had proved satisfactory. For 10 years Maimonides worked and produced this digest, in which he arranged in scientific order all the material which a Jewish jurist and theologian might be called upon to use. Though this digest was received with delight by the Jews of Spain, many were found who looked upon Maimonides' work as an attempt to crystalize into unchangeable law the fluctuating streams of tradition. The same objection was made to his attempt to formulate into a creed the purely

theological ideas of the Judaism of his day. His 'Thirteen Articles' brought on a war of strong opposition; and though in the end, the fame of their author conquered a place for them even in the Synagogue Ritual, they were never accepted by the entire Jewry. They remained the presentation of an individual scholar.

But his chief philosophical work, his 'Guide of the Perplexed' (Dalâlat al Hâirin), carried him still further: and for centuries fairly divided the Jewish camp into two parties. The battle between the Maimonists and anti-Maimonists waged fiercely in Spain and Provence.

In the 'Guide of the Perplexed' Maimonides has also produced a work which was "epoch-making in Jewish philosophy. It is the best attempt ever made by a Jew to combine philosophy with theology. Aristotle was known to Maimonides through Al-Farâbi and Ibn Sînâ (Avicenna); and he is convinced that the Stagyrite is to be followed in certain things, as he is that the Bible must be followed in others. In fact, there can be no divergence between the two; for both have the same end in view,— to prove the existence of God. The aim of metaphysics is to perfect man intellectually; the same aim is at the core of Talmudic Judaism. Reason and revelation must speak the same language; and by a peculiar kind of subtle exegesis — which provoked much opposition, as it seemed to do violence to the plain wording — he is able to find his philosophical ideas in the text of the Bible. But he is careful to limit his acquiescence in Aristotle's teachings to things which occur below the sphere of the moon. He was afraid of coming into contact with the foundations of religious belief, and of having to deny the existence of wonders. The Bible teaches that matter was created, and the arguments advanced in favor of both the Platonic and Aristotelian views he looks upon as insufficient. The Jewish belief that God brought into existence not only the form but also the matter of the world, Maimonides looks upon much as an article of faith. The same is true of the belief in resurrection. He adduces so little proof for this dogma that the people of his day were ready to charge him with heresy.

Maimonides is able to present 25 ontological arguments for his belief in the existence, unity and incorporeality of God. What strikes one most is the almost colorless conception of the Deity at which he arrives. In his endeavor to remove the slightest shadow of corporeality in this conception, he is finally led to deny that any positive attributes can be posited of God. Such attributes would only be "accidentia"; and any such "accidentia" would limit the idea of oneness. Even attributes which would merely show the relation of the Divine Being to other beings are excluded; because he is so far removed from things non-Divine, as to make all comparison impossible. Even existence, when spoken of in regard to him, is not an attribute. In his school language, the "essential" of God involves his "existentia." We have therefore to rely entirely upon negative attributes in trying to get a clear concept of the Deity.

If the Deity is so far removed, how then is he to act upon the world? Maimonides supposes that this medium is to be found in the world of the spheres. Of these spheres there are nine: "the all-encompassing sphere, that of the fixed stars, and those of the seven planets." Each sphere is presided over by an intelligence which is its motive power. These intelligences are called angels in the Bible. The highest intelligence is immaterial. It is the *noûs poietikós*, the ever-active intellect. It is the power which gives form to all things and makes that which was potential really existent. "Prophecy is an emanation sent forth by the Divine Being through the medium of the active intellect, in the first instance to man's rational faculty and then to his imaginative faculty. The lower grade of prophecy comes by means of dreams, the higher through visions accorded the prophet in a waking condition. The symbolical actions of the prophets are nothing more than states of the soul." High above all the prophets Maimonides places Moses, to whom he attributes a special power, by means of which the active intellect worked upon him without the mediation of the imagination. The psychological parts of the 'Guide' present in a Jewish garb the Peripatetic philosophy as expounded by Alexander of Aphrodisia. Reason exists in the powers of the soul, but only potentially as latent reason (*noûs húlikos*). It has the power to assimilate immaterial forms which come from the active reason. It thus becomes acquired or developed reason (*noûs epiktetos*); and by still further assimilation it becomes gradually an entity separable from the body, so that at death it can live on unattached to the body. In ethics Maimonides is a strong partisan of the doctrine of the freedom of the will. No one moves him, no one drives him to certain actions. He can choose, according to his own inner vision, the way on which he wishes to walk. Nor does this doctrine involve any limitation of the Divine power, as this freedom is fully predetermined by the Deity. But Maimonides must have felt the difficulty of squaring the doctrine of the freedom of the will with that of the omniscience of God; for he entrenches himself behind the statement that the knowledge of God is so far removed from human knowledge as to make all comparison impossible. Again, in true Aristotelian style, Maimonides holds that those actions are to be considered virtuous which follow the golden mean between the extremes of too much and too little. The really wise man will always choose this road; and such wisdom can be learned; by continued practice it can become part of man's nature. He is most truly virtuous who has reached this eminence, and who has eliminated from his own being even the desire to do wrong.

The daring with which Maimonides treated many portions of Jewish theology did not fail to show its effect immediately after the publication of the 'Guide.' His rationalistic notions about revelation, his allegorizing interpretation of Scripture, his apparent want of complete faith in the doctrine of resurrection, produced among the Jews a violent reaction against all philosophical inquiry, which lasted down to the times of the French Revolution. Even non-Jews looked askance at his system. In Montpellier and in Paris, his own Jewish opponents, not content with having gotten an edict against the use of the master's writings, obtained the aid of the Church (for the 'Guide' had been translated into Latin in the 13th century), and had it publicly consigned to the flames. But all

this was only further evidence of the power which Maimonides wielded. The Karaites copied it; the Kabbalah even tried to claim it as its own. Many who were not of the house of Israel, as Thomas Aquinas and Albertus Magnus, acknowledged the debt they owed the Spanish rabbi; and Spinoza, though in many places an opponent, shows clearly how carefully he had studied the 'Guide of the Perplexed.' Consult Yellin and Abrahams, 'Maimonides,' and the authorities there mentioned; Neumark, 'Geschichte der jüdischen Philosophie des Mittelalters' (Vols. I–II, Berlin 1907–10).

GUSTAV GOTTHEIL.

MAIN, mān, **Hubert Platt,** American composer and editor: b. Ridgefield, Conn., 17 Aug. 1839. He was educated in the public schools and for 59 years has been editor of song collections and other publications for church, Sunday school and college use, besides composing many songs and hymns. His latest works include 'Gems of Song for the Sunday School' (1901); 'Gloria Deo' (1901); 'Devotional Songs' (1903); 'Hallowed Hymns' (1907); 'Bixby's Home Songs' (1909); 'Hebrew Hymnal' (1910); Ode Book, 'Eastern Star' (1911); 'Mission Hymnal' (1911–14); 'Quartettes and Choruses — Male Voices' (1912); 'Hamilton College Songs' (1915). He has also in preparation 'A Dictionary of American Musicians and Poets.'

MAIN, mān (Ger. mīn), or **MAYN,** a river of Germany, which has its source in the northeastern part of Bavaria, about 13 miles northwest of Bayreuth. It flows northwest to the border of Bavaria, and then makes a succession of remarkable zigzags, continuing, however, in a westerly direction, till it reaches the border of the grand-duchy of Hesse, which it enters. It then flows circuitously west, partly forming the boundary between Hesse and the Prussian province of Hesse-Nassau, and joins the Rhine a little above the town of Mainz, after a course of over 300 miles. The principal cities which it passes are Würzburg, Aschaffenburg and Frankfort. It is navigable for about 200 miles, and by improvements the largest Rhine steamers can ascend to Frankfort. By means of King Ludwig's Canal it affords through navigation to the Danube.

MAINE, mān, SIR **Henry James Sumner,** English jurist: b. Caverham Grove, Reading, England, 15 Aug. 1822; d. Cannes, France, 3 Feb. 1888. He was educated at Cambridge, where he was regius professor of civil law 1847–54. He was in India as legal member of the council, 1862–69. On his return, in 1869, he was appointed professor of jurisprudence at Oxford, and held this post till 1878. He was appointed master of Trinity Hall, Cambridge, 1877, and professor of international law at Cambridge, 1887–88. Among his more noted works were 'Ancient Law' (1861), an epoch-making book; 'Village Communities' (1871); 'Popular Government' (1885). Consult Duff, 'Sir Henry Maine: a Brief Memoir of his Life' (1892).

MAINE DE BIRAN, mān dė bē-rŏn, **François Pierre Gonthier,** French philosopher: b. Bergerac (Dordogne), 29 Nov. 1766; d. Paris, 16 July 1824. He entered the Life Guards of Louis XVI in 1785, was present at Versailles on 5–6 Oct. 1789, but was not concerned in the Revolution. He opposed Napoleon in the latter part of his reign, and became a legitimist at the Restoration. His chief philosophical essays are 'Influence de l'habitude' (1803); 'Sur la décomposition de la pensée'; 'Sur l'apperception immédiate,' and 'Rapports du physique et du moral.' Very little of his writing appeared during his lifetime, but in 1834 some of his essays were published by Victor Cousin who in 1841 published a more complete edition. The publication of his important writings by E. Naville in 1859 made possible the first connected study of his philosophical development. Maine de Biran's importance as a philosopher is chiefly due to his giving the direction to philosophic speculation afterward developed in the school founded by Cousin. Consult Naville, E., 'Maine de Biran' (3d ed., Paris 1874); Couaillhac, M., 'Maine de Biran' (Paris 1905).

MAINE, the name given as early as 1622 to distinguish the *main land* from the islands. It was called in the Mason and Gorges Patent "the Mayn Land of New England," and in the great charter "Province of Maine." It is one of the New England group of North Atlantic States and the most easterly State of the Union. It is between lat. 43° 4′ and 47° 28′ N., and between long. 66° 57′ and 71° 7′ W. It is bounded on the north by Quebec and New Brunswick, provinces of Canada, on the east by New Brunswick and the Atlantic Ocean, on the south by the Atlantic and on the west by the State of New Hampshire and the province of Quebec. Its greatest extent is from north to south; its greatest length about 303 miles and its greatest width about 212 miles; area, 33,040 square miles, of which 3,000 square miles are water surface. Maine is as large as all the rest of the New England group lacking 385 square miles, and it is the 37th in size among the States of the Union.

Topography.— While its northeastern and a portion of its southwestern boundary lines are straight, its others are irregular, especially its coast line, which, fringed by islands, is indented by numerous bays, giving it a shore length of over 2,000 miles, though a direct line drawn from its two extremities would be but about a tenth of its real length. This irregular coast line, bold and rugged from its eastern extremity until it reaches Penobscot Bay, becoming lower as it approaches the south, is most picturesque throughout its entire length, much of it being bordered by sandy beaches and thick forests reaching to the water's edge. There are more good harbors on the coast of Maine than on that of any other State on the Atlantic seaboard.

There are two general mountain slopes in Maine, the highest part extending across the State from north of the source of the Megalloway River in the west, northeast to Mars Hill. South of the main divide is Mount Katahdin, 5,385 feet in height; Mount Abraham, 3,387; Saddleback, 4,000, and Mount Blue, 3,900 feet in height, all in Franklin County. Green Mountain on Mount Desert Island is 1,800 feet high; and is one of the numerous peaks more or less conical in form, isolated or in clusters, comparatively bare of soil and densely wooded about their bases. There is no long range of mountains in the State.

MAINE.

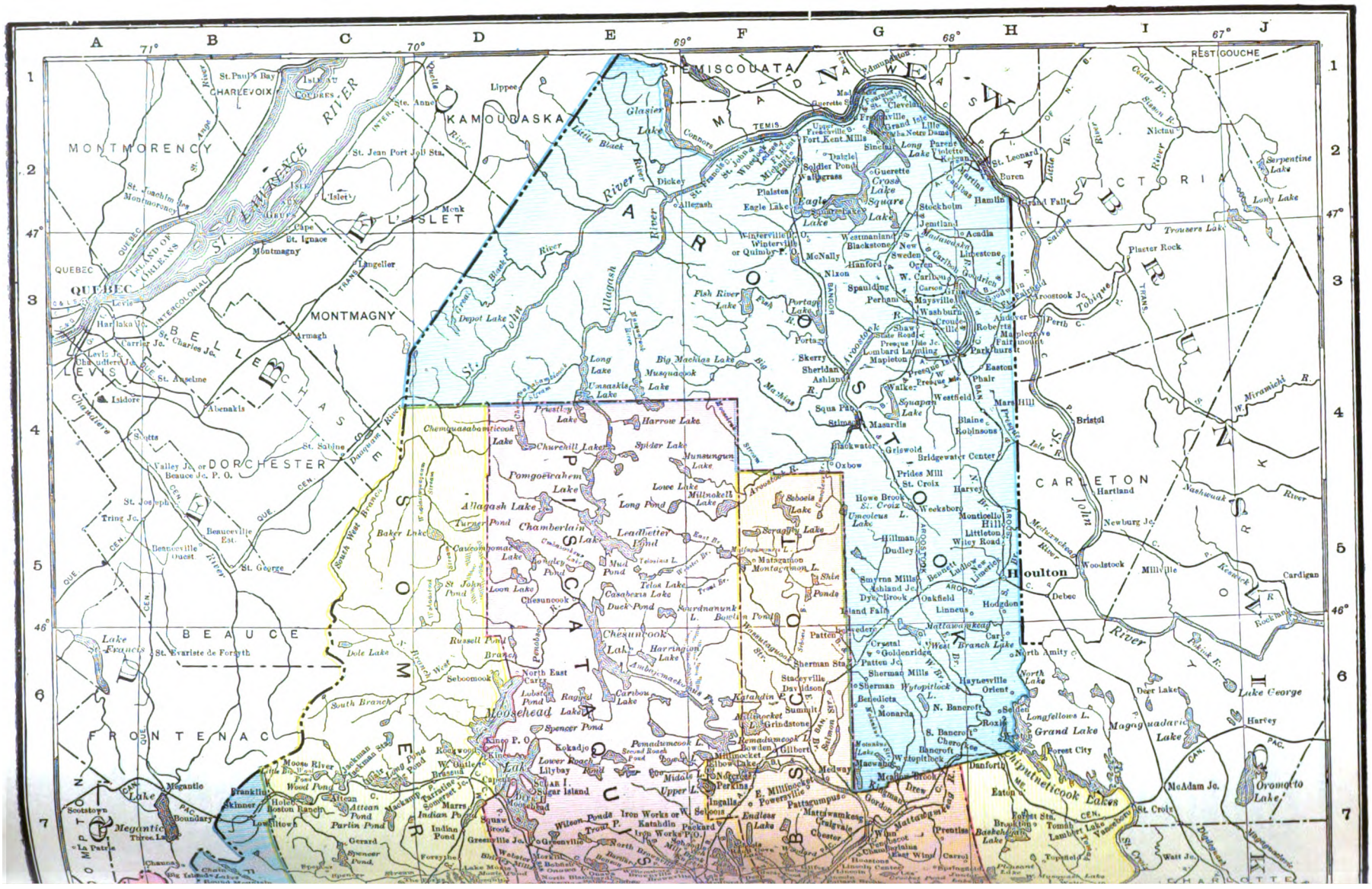
Estimated population, 772,489

COUNTIES

Pop.			Pop.		
59,822	Androscoggin	C 11	36,256	Oxford	B 9
74,664	Aroostook	F 4	85,285	Penobscot	F 8
112,014	Cumberland	B 12	19,887	Piscataquis	E 5
19,119	Franklin	B 8	18,574	Sagadahoc	D 12
35,575	Hancock	G 10	36,301	Somerset	C 6
62,863	Kennebec	D 10	23,383	Waldo	E 10
28,981	Knox	E 11	42,905	Washington	H 8
18,216	Lincoln	D 11	68,526	York	B 13

Incorporated Cities, Towns, and Villages

16,393	Auburn	C 11	2,864	Hallowell	D 11
14,170	Augusta	D 11	5,845	Houlton	H 5
26,659	Bangor	F 9	27,809	Lewiston	C 11
9,396	Bath	D 12	1,167	Lincoln	F 8
4,618	Belfast	F 10	2,408	Madison	D 9
834	Bethel	B 10	2,215	Norway	B 10
17,665	Biddeford	B 13	6,317	Old Town	F 9
5,667	Brewer	F 9	473	Oxford	B 11
1,474	Bridgton	B 11	262	Paris	B 10
5,341	Brunswick	C 12	823	Phillips	C 9
357	Buckfield	B 11	2,231	Pittsfield	E 9
6,116	Calais	I 8	63,867	Portland	C 13
5,377	Caribou	G 3	2,938	Presque Isle	G 3
83	East Pittston, Kennebec	D 10	695	Rangeley	B 6
4,961	Eastport	I 9	8,186	Rockland	E 11
3,549	Ellsworth	F 10	5,427	Rumford	B 10
2,801	Fairfield	D 10	6,583	Saco	B 13
1,240	Farmington	C 10	5,341	Skowhegan	D 9
1,620	Fort Fairfield	D 10	1,542	South Paris	B 11
965	Freeport	C 11	7,471	South Portland	C 13
540	Fryeburg	B 7	12,702	Waterville	D 10
5,311	Gardiner	D 11	8,908	Westbrook	B 12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TEMISCOUATA
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MONTMORENCY
MONTMAGNY
L'ISLET
QUEBEC
BELLECHASSE
LEVIS
DORCHESTER
BEAUCE
FRONTENAC
COMPTON
WOLFE
MEGANTIC
ARTHABASKA
LOTBINIERE
PORTNEUF
QUEBEC
MEDDYBEMPS
MADAWASKA
VICTORIA
RESTIGOUCHE
CARLETON
YORK
SUNBURY
QUEEN'S
SOUTHAMPTON
NORTHUMBERLAND
KENT
GLOUCESTER
RESTIGOUCHE
Houlton
Woodstock
Fredericton
Chipmuneticook Lakes
Grand Lake
Lake George
Megantic
Aroostook R.
St. John R.
St. Lawrence River
Temiscouata Lake
Lake Francis
Spencer Pond
Moosehead Lake
Kineo P. O.
Sugar I.
Sugar Island
Lower Roach Pond
Upper Roach Pond
Seboomook
Chesuncook Lake
Chamberlain Lake
Allagash Lake
Eagle Lake
Square Lake
Cross Lake
Fish River Lake
Portage Lake
Long Lake
Umsaskis Lake
Big Machias Lake
Musquacook Lake
Harrow Lake
Spider Lake
Churchill Lake
Millinocket Lake
Long Pond
Lowe Lake
Telos Lake
Caseburia Lake
Duck Pond
Mud Pond
Loon Lake
Baker Lake
Turner Pond
Caucomgomoc Lake
Gowdey Pond
Russell Pond
Dole Lake
Harrington Lake
Carabou Lake
Raynal Pond
Lobster Pond
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Allagash R.
Fish R.
Big Black R.
Little Black R.
Connors R.
Dickey
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Soldier Pond
Wallagrass
Frenchville
Grand Isle
Sinclair
Long Pond
Violette
Keegan
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Caribou
Stockholm
Jemtland
Limestone
Acadia
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Blackstone
New Sweden
Orcen
Caribou
Madawaska
Van Buren
St. Leonard
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Long Lake
Trousers Lake
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Griswold
Oxbow
Blackwater
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Prides Mill
St. Croix
Harvey
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Nashwaak River
Newburg Jct.
Woodstock
Millville
Cardigan
Debec
Rockland
Meduxnekeag River
Monticello
Hillman
Dudley
Littleton
Wiley Road
Howe Brook
Weeksboro
Umcolcus L.
Sebois
Sebois Lake
Scraggly Lake
Millinocket L.
Matagamon L.
Montagamon L.
Shin Ponds
Island Falls
Smyrna Mills
Ashland Jct.
Dyer Brook
Oakfield
Linneus
Hodgdon
Patten
Crystal
Goldenridge
Sherman Sta.
Sherman Mills
Sherman
Haynesville
Orient
North Amity
West Branch Lake
Wytopitlock L.
Benedicts
Monarda
N. Bancroft
S. Bancroft
Roxton
Longfellows L.
Forest City
Danforth
Eaton
Meadow Brook
Drew
Kingman
Gordon
Matagamon Lake
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Medway
Millinocket
Grindstone
Summit
Katahdin
Mattawamkeag
Craigvale
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Basketchegan Lake
Forest Sta.
Brookton
Tomah
Lambert Lake
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St. Croix
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Oromocto Lake
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Oromocto Lake
Watt Jct.
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Lake Megantic
Scotstown
Boundary
Franklin
Skinner
Holden
Boston Ranch
Lowlitown
Moose River
Little Big Wood Pond
Wood Pond
Attean
Attean Pond
Parlin Pond
Jackman
Jackman Sta.
Indian Pond
Marrs
Rockwood
W. Outlet
Brassua
Squaw Brook
Greenville Jct.
Greenville
Gerard
Spencer Pond
Pond
Wilson Ponds
Trout P.
Iron Works or W.
Iron Works P.O.
Katahdin
Packard
Second Roach Pond
Seboomook
Ingalls
Endless Lake
Millinocket
Perkins
Pattagumpus
Mattawamkeag
Lake Megantic
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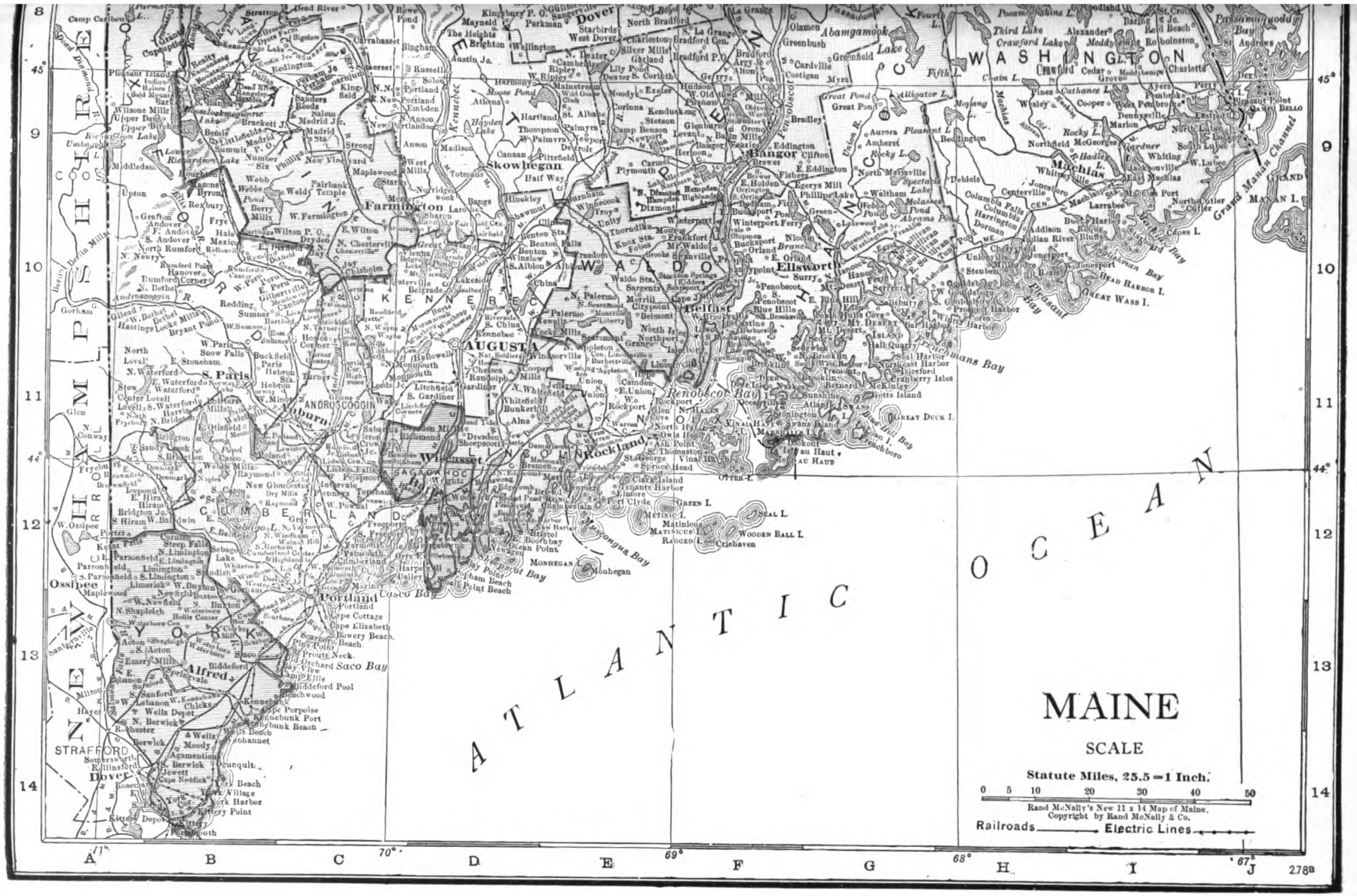
Carroll


MAINE
SCALE
Statute Miles, 25.5 = 1 Inch.
0 5 10 20 30 40 50
Rand McNally's New 11 x 14 Map of Maine.
Copyright by Rand McNally & Co.
Railroads
Electric Lines
ATLANTIC OCEAN
AUGUSTA
Portland
Bangor
Belfast
Ellsworth
Rockland
Waterville
Lewiston
Farmington
Skowhegan
Dover
Alfred
Biddeford
Saco Bay
Casco Bay
Penobscot Bay
Machias Bay
Frenchmans Bay
Passamaquoddy Bay
Grand Manan Channel
Grand Manan I.
Great Wass I.
Great Duck I.
Mount Desert I.
Deer Isle
Isle au Haut
Matinicus I.
Monhegan
Monhegan I.
Seal I.
Wooden Ball I.
Criehaven
Ragged I.
Otter I.
Gooseberry I.
Cape Porpoise
Kennebunk Port
Kennebunkport
Wells Beach
Ogunquit
York Beach
York Village
York Harbor
Kittery Point
Kittery
Portsmouth
Old Orchard Beach
Cape Cottage
Cape Elizabeth
Bowery Beach
Scarboro Beach
Prouts Neck
Biddeford Pool
Pine Point
Saco
Old Orchard
Bay View
Camp Ellis
Beachwood
Wells Depot
Wells
Moody
Agamenticus
Berwick
South Berwick
Rollinsford
Somersworth
Gonic
Rochester
North Berwick
Lebanon
West Lebanon
Sanford
Springvale
Alfred
Emery Mills
Acton
Shapleigh
North Shapleigh
Waterboro
Waterboro Corner
Hollis Center
Newfield
West Newfield
Limerick
Ossipee
Maplewood
Parsonsfield
South Parsonsfield
North Limington
East Limington
Limington
Steep Falls
Corinna
Kenduskeag
Stetson
Glenburn
Orono
Old Town
Veazie
Hudson
Milford
Oldtown
Indian Old Town
Alton
Argyle
Bradford
Bradford Cen.
Bradford P.O.
La Grange
La Grange Cen.
North Bradford
Charleston
Silver Mills
Garland
Dexter
Dexter S.
Corinth
Lily Pond
Ripley
W. Ripley
Cambridge
Starbird's
West Dover
Dover
Foxcroft
Guilford
Sangerville
Abbot
Abbot Village
Monson
Monson Jc.
Parkman
Kingsbury P. O.
Mayneld
The Heights
Brighton
Wellington
Austin Jc.
Bingham
Solon
Embden
Russell
Harmony
Moose Pond
Athens
Hartland
Thompson
Palmyra
W. Palmyra
Newport
Detroit
Canaan
Pittsfield
Skowhegan
Half Way
Madison
Anson
New Portland
Portland
Starks
Norridgewock
Mercer
Sharon
Farmington
Farmington Falls
Farmington Cen.
Fairbanks
Temple
Weld
Webb's Mills
Webb Pond
Berry Mills
Strong
New Vineyard
Maplewood
West Mills
Totman's
Hinckley
Newhurst
Harmon
Bangs
Clifton
Benton Sta.
Benton
Benton Falls
Winslow
S. Albion
Albion
China
Vienna
Belgrade
Belgrade Lakes
Oakland
Waterville
Lakeville
Smithfield
Redington
Redington Jc.
Dead River
Stratton
Eustis
Flagstaff L.
Flagstaff
Carrabassett
Kingfield
Sanders Reeds
Madrid
Madrid Jc.
Madrid Sta.
Phillips
Phillips Jc.
Salem
Salem Jc.
Beals
Beals Island
Jonesport
Addison
Addison Point
Indian River
Bluffs
Cherryfield
Unionville
Millbridge
Steuben
Gouldsboro
Gouldsboro Pt.
Prospect Harbor
Sullivan
Sullivan Harbor
Hancock
Hancock Pt.
Franklin
Franklin Road
Franklin Pt.
Salisbury Cove
Somesville
Southwest Harbor
Northeast Harbor
Seal Harbor
Pretty Marsh
Tremont
Bernard
McKinley
Bartlett Island
Sutton Island
Islesford
Cranberry Isles
Sunshine
Atlantic
Stonington
Deer Isle
Sargentville
Brooklin
Brooksville
Blue Hill
Blue Hill Falls
Surry
Ellsworth
Ellsworth Falls
Hancock
Orland
Bucksport
Bucksport Pt.
Verona
Prospect
Prospect Ferry
Winterport
Winterport Ferry
Frankfort
Mt. Waldo
Searsport
Searsport Harbor
Stockton Springs
Sandypoint
Penobscot
South Penobscot
Castine
Hampden
Hampden Highlands
Dixmont
Plymouth
Carmel
Levant
Kenduskeag
Bangor
Brewer
Orrington
Holden
East Holden
Egerys Mill
Fiskers
Phillips Lake
Eddington
East Eddington
Clifton
Greenbush
Olamon
Cardville
Costigan
Greenfield
Myra
Abamgamook Lake
Great Pond
Alligator L.
Pleasant L.
Aurora
Amherst
Rocky L.
Bedington
North Marshville
Waltham
Molasses Pond
Abrams Pond
Deblois
Centerville
Jonesboro
Columbia Falls
Columbia
Harrington
Dorman
Addison
Indian River
Bluffs
Machias
Machias L.
Whitneyville
Machiasport
East Machias
Machias Port
Northfield
McGeorges
Marion
Wesley
Cooper
Pembroke
Dennysville
Pennamaquoddy Bay
Andrews
Robinston
Charlotte
Crawford
Cedar
Meddybemps
Third Lake
Crawford Lake
Alexander
Meddy
Red Beach
Pocomoonshine L.
Baring
St. Croix
St. Stephen
Milltown
Calais
Woodland
Fourth L.
Fifth L.
Chain L.
Grove
Pines
Cathance L.
Ayers
Perry
Pembroke
Eastport
Pleasant Point
Indian Reservation
Passamaquoddy Bay
Campobello I.
Deer I.
Head Harbor I.
Great Wass I.
Pleasant Bay
Narraguagus Bay
Milbridge
Harrington
Dorman
Columbia Falls
Jonesport
Beals
Beals Island
Addison

Hydrography.— That portion of the State north of the main divide is drained almost wholly by the Saint John River and its tributaries, and the part south of the main divide is drained chiefly by the Androscoggin, Kennebec, Penobscot and Saint Croix rivers. The basin of Saint John River has an area of about 7,425 square miles. The head-waters of this river are in the northwestern part of Maine and the eastern part of Quebec, and it flows north by east for some distance past Saint Francis on the north to the extreme northeastern boundary, where it makes a turn and flows generally southeast through New Brunswick to the Bay of Fundy. The largest Maine tributaries of the Saint John are the Aroostook and the Allegash. The waters of a large number of the lakes of Maine find their outlet through the Saint John. The rivers south of the main divide flow generally south to the ocean. The source of the Kennebec is about 2,000 feet above the sea, of the Penobscot over 2,300 feet, of the Androscoggin about 3,000 feet and of the Saco in the southwest nearly 2,000 feet. They, together with their tributaries, are swiftly flowing streams, in many places passing over rocky beds which form rapids and falls and furnish extensive water powers. From the report of the Maine State Water and Storage Commission it appears that Maine ranks third among the States of the Union in developed horse power which is estimated to be in excess of 400,000 horse power. Its storage facilities are estimated at 400,000 horse power more, which, with over 1,000,000 undeveloped horse power, make a total of over 1,800,000 possible water horse power in the State. It is without doubt among the greatest of the State's assets, and has excited the cupidity of men in and out of the State to exploit it for their own enrichment. The so-called Octopus Bill of 1911 was designed to enable these interests to transmit this power by converting it into electricity beyond the State's limits, but attracting attention aroused so much opposition that it was defeated. It is only by getting control of the political machinery of the State that the interests responsible for the measure can accomplish their designs which would result in immense loss to the people of the State. The flow of the tide is so great on the coast that it has been estimated "that with suitable wheels it can be operated 16 hours out of the 24." There are about 1,620 lakes in Maine, a large number of which are near the sources of the rivers. The surface of the lakes and rivers constitutes nearly one-tenth of the whole area of the State. Moosehead Lake is the largest in the State. (For description of rivers, see separate articles).

Geology.— The nature of the geological formation of Maine shows that it belongs to one of the oldest parts of the United States. The marks of the Glacial period may be plainly traced in several parts of the State; the changes in extent and form of the river beds and lakes are shown by the rock formation of the vicinity and the nature of the deposits which were brought from the mountains to the valleys. The northern portion of the State belongs to the Devonian period and the region about Penobscot Bay to the Silurian. In the southern part of the State are fossiliferous clays. There are a number of low ridges which evidently were once portions of mountain ranges, but which usually formed angles with the two great ranges that at one time extended across the State. Granite, slate and marble exist in large quantities.

Soil.— The soil of the State shows the effects of the Glacial period as much as the rocks; the greater part of the surface is till and various forms of glacial débris. The old lake bottoms, now dry land, are largely alluvial and in these places the soil is very fertile. In such localities there are extensive agricultural lands.

Minerals and Mining.— Granite is one of the most important wealth producing minerals of the State. Along the coast and inland for some distance there are large areas of granite outcrop. It is found in such quantities near tide water that quarrying and shipping are comparatively easy and inexpensive. The feldspar and quartz are easily separated. Hallowell, Dix Island, Vinal Haven and Freeport furnish the largest quantity. The capitol at Albany, N. Y., and the Metropolitan Museum of Art, New York City, are built of granite from Hallowell. Crystalline limestone and marble are found in several places; in the southwestern part of the State the deposits are quite extensive. Slate of good quality is found in the central part of the State. It is quarried for table tops, blackboards, roofing and for mantels. The slate from Piscataquis County is remarkably pure, capable of being split into thin plates, and in color a deep blue-black. Silica and feldspar of an excellent quality are found in several places. Some of the products made in whole or in part from silica and feldspar are glass, porcelain, scouring soap, sandpaper, earthenware and woodfiller. The silica is found in vein-quartz in some of the crystalline rocks. Tourmalin is found in Oxford County in large and beautiful crystals. Some of the other minerals are iron, copper, zinc, arsenic, manganese, tin, silver, gold, antimony, pyrites and beryl. The annual value of the mineral output is about: granite, $1,000,000; limestone and marble, $1,000,000; slate, $180,000; silica, $50,000; other mineral products, $60,000, making the total amount for quarry purposes of about $2,600,000. Maine ranks second among the States in the output of granite; fourth in the output of slate and sixth in the output of limestone and marble.

There are in the State nearly 30 mineral springs which are known and used; 10 of them are in Androscoggin County. The State reports about 30 springs with an output of about 1,850,000 gallons. The most noted of these is the Poland spring situated in the town of that name.

Climate.— The climate is cold a considerable part of the year; snow covers the ground from three to five months. The summers are short; in the southern part of the State there is not more, usually less, than five months for the maturing of crops. The extensive forests have been a protection, and with the good river drainage and the sea breezes have tended to make the climate most healthful. A fair average of the mean temperature in January is 15° F.; in May 52°; in July 68°; in October 51°; in December 22°. The average temperature in the whole State is in summer about 62.5° F. and in winter 20° F.

Flora.— The trees and plants common to the northeastern part of the United States flourish

here. In the southern part are fine grasses, hardy fruits and a varied shrubbery. The strawberry, blackberry, raspberry, blueberry, thorn-apple and gooseberry grow in all parts of the State. (See *Forests* and *Agriculture*).

Fauna.— Maine has a large number and variety of animals, among which are bear, caribou, deer, moose, fox, beaver, sable, marten, mink, weasel, squirrel, rabbit, porcupine and wildcat. Wild geese, duck, teal; plover, gulls and various other sea fowl are found about its lakes and sea coasts; partridges, robins, bobolinks, orioles and other birds belonging to the north temperate zone are common. The waters of Maine abound with fish in great variety. (See section *Fisheries*).

Forests.— Maine is known as the "Pine Tree State" because of the large extent of pine forests which once existed within its limits. The majestic "mast pine," which the State once furnished for many ships, has almost become a thing of the past, yielding to the demands of commerce. The greatest part of the State is covered with forests; about 65 per cent of the State's land area is woodland. The northern and central parts are forest; in the southern part along the coast and along the navigable streams the land is cleared and cultivated. Trees grow rapidly. Denuded tracts, unless cultivated soon, send up an undergrowth of seedlings which become trees of fair size in the course of a few years. Most of the lumber of Maine used in the manufacture of pulp and paper has been taken from the drainage of the Androscoggin, Kennebec and Penobscot rivers, in about the following proportions: 42 per cent from the Androscoggin; 25 per cent from the Kennebec and 33 per cent from the Penobscot. The total area from which the whole pulp lumber consumed in the State has been taken has been estimated at 4,741,000 acres, leaving more than one-half the entire region from which no pulp wood of any consequence has ever been removed. There has been estimated standing 21,239,000,000 feet of spruce alone, besides an almost equal quantity comprising pine, cedar, hemlock, poplar and various species of hard wood. The annual growth is considered sufficient to warrant the cutting of 600,000,000 feet of spruce timber each year, without depleting the supply. The forest commissioner states that it is safe to reckon that there will be from 11,000,000 to 12,000,000 acres of land in the State that will be lumber producing for all time. There are now being taken annually upwards of 30,000,000 feet of white birch from Maine forests. The white birch area is a wide belt extending entirely across the State. Though used for many purposes its greatest utilization is by spool factories which produce about 800,000,000 spools, valued at more than $1,000,000. Besides being used in the production of spools a large quantity is shipped to Europe in spool bars. A variety of small articles are also manufactured from it, as baskets, furniture, office equipments, etc. The science of forestry is being employed extensively in the preservation of timber by private corporations.

Fisheries.— The rivers and lakes are well stocked with fish; the State is considered the sportsman's paradise. Some of the varieties are the speckled trout, sturgeon, pickerel, salmon, bass and bream. Lobsters, clams and mussels are in large quantities along the coast, and in the bays and inlets are bluefish, rock-cod, sculpins, cunners, flounders and others. In the off-shore waters there are cod, herring, mackerel, haddock, hake, porgy, menhaden and pollock, which are caught in large quantities. One species of herring, the *Culpea harengus*, furnishes a large portion of the fish used in the sardine-canning establishments of Lubec, Eastport and other places. The fisheries of Maine rank second in value among the fisheries of New England, but more men are engaged in this industry in Maine than in any other New England State except Massachusetts. The commissioner of sea and shore fisheries for 1914 estimates the number of persons dependent upon the fisheries at 50,000 and the value of the product at $5,786,000.

In 1892 the lobster fisheries product was $992,855, this amount being greater than for all lobsters in all the other New England States. The law passed in 1895 for the protection of the lobster fisheries greatly curtailed this branch of the fishing industry, as it prohibited the taking of lobsters less than 10½ inches in extreme length. This caused the removal of canning establishments to Nova Scotia, New Brunswick and the Magdalen Islands. The government experiment stations plant large quantities of lobster fry along the coast. The value of the catch for the year 1913–14 was $3,277,806. Clam fishing ranks next in importance; canning clams is a prominent industry, also the preparation of smoked herring. Salmon fishing is largely in the Penobscot and Kennebec rivers. The fishery trade is centred chiefly at Portland, Rockland and Vinal Haven. The sardine fisheries are located in Washington, Hancock, Lincoln and Cumberland counties. The following quantity of fish cured and canned was, according to last report, 8,751,392 pounds of sardines and 2,173,277 pounds of clams. During the 10 years preceding 1909 this industry grew from 74,022,141 pounds to 116,289,900 pounds, and increased in value from $4,753,071 to $5,738,685.

Agriculture and Stock Raising.— The soil of a considerable portion of the State is not adapted to agriculture, owing to the large acreage of forest land. But a little over 33 per cent is farm land and of that nearly one-third is not improved. The most fertile lands are in the river valleys, the largest acreage being in the northeastern part of the State in the Aroostook Basin. The farms average in size about 105 acres, and less than 5 per cent of the farms are occupied by tenants (Government Census Bulletin for 13 Dec. 1910). The owner living on the farm means more intensive methods of cultivation, a systematic enrichment of the soil and a careful rotation of crops. The cereal crops, especially wheat, have decreased in extent owing to Western competition, but in Aroostook County they are increasing. The Federal census of 1910 shows that in this county the cereals occupied one-half the total of the cereal acreage of the State. The crop of oats, once large, has also decreased; yellow corn, formerly cultivated on all the farms, never occupied much area and is now raised principally for fodder. The finest sweet corn in the world is raised in Maine for canning and goes to all parts of the country.

The green-corn industry originated with Isaac Winslow who invented the process in 1838–39. On 8 March 1853 he applied for a

patent for preserving fresh green corn by hermetically sealing process. In suits against infringers of the patents it appeared that the canning of corn originated in Maine at the early dates mentioned, and Maine-packed sugar corn still leads in all markets. In 1915 Maine packed 1,959,000 dozen green corn, valued at $1,470,750.

Buckwheat, which produces excellent flour in a soil and climate like Maine, is still cultivated. The returns from the potato crop are greater than from all the cereals. Hay of an excellent quality is marketed at good prices. Farmers living near markets are giving considerable attention to market gardening and dairying. Fine grained vegetables, sweet corn, small fruits and apples flourish and bring excellent returns. Apple orchards are increasing in number and increased attention is being given to their care and cultivation. The raising of horses is increasing, but the number of neat cattle and sheep is decreasing. The number of milch cows is increasing. The statistics of 1900 show that nearly 30 per cent of the farms derived more income from dairy products than from all other sources. However, such statistics are sometimes unreliable as a large part of the living of the farmer's family comes from the farm, but that only is reckoned as income which is sold from the farm. The amount received in 1900 for dairy products was about $5,605,000. The Federal Census Reports of 1910 gave the following statistics: 59,773 farms, covering 6,291,000 acres, of which 3,933,000 acres were unimproved. The total value of the farm property of the State was $199,271,998. The value of the products for 1899 was $37,104,375. For the year ending 1 June 1910 some of the farm products were as follows:

	Quantity	Value
Hay	1,750,000 tons	$22,400,000
Potatoes	27,940,000 bushels	11,735,000
Oats	5,554,000 bushels	2,666,000
Buckwheat	748,000 bushels	509,000
Corn	782,000 bushels	555,000
Barley	248,000 bushels	188,000
Wheat	267,000 bushels	272,000

In 1917 the chief crops were oats, 4,930,000 bushels; corn, 780,000 bushels.

In 1910 the farm animals were:

	Number	Value
Horses	107,574	$14,364,756
Sheep	206,434	813,976
Milch cows	156,819	5,874,228
Other cattle	99,704	1,910,156

In 1918 the farm animals comprised 109,000 horses, 170,000 milch cows, 127,000 other cattle, 163,000 sheep and 100,000 swine. In 1916 the wool clip amounted to 850,000 pounds of wool.

New Sweden.— In 1876 a Swedish colony consisting of 50 persons was located in the northern part of Aroostook County by the Hon. W. W. Thomas, Jr., Commissioner of Immigration. That portion of Township No. 15 upon which they were located was named New Sweden. Its present number is 905. It is estimated that there are now in Maine 5,000 Swedes, a large number being descendants of the Thomas colony. The success of the settlement, owing to the high character for thrift and industry of the colonists, has been so great that Mr. Thomas is planning to establish another colony in Aroostook County if the land can be obtained. Aroostook County leads all others in the value of its potato crop.

Manufactures.—The extensive water power has been a great aid in developing manufacturing industries. Ship-building was among the first manufacturing industries of the State. The first vessel built in Maine was the *Virginia*. She was built by the Popham colony 1607–08, and under command of Capt. James Davis sailed from Plymouth with the Somers and Gates Colony for Jamestown, 1 June 1609. Bath was the chief ship-building centre of the United States for over 100 years and is yet a ship-building centre of importance. Prior to the construction of steel vessels, the Maine forests supplied a large amount of the timber used in ocean vessels built in the United States and nearly half the ocean vessels of the nation, up to 1900, were made in Maine. Bath builds now many steel vessels. The manufacture of leather is another of the leading industries. The bark of the hemlock is used in large quantities for tanning. The manufacturing of cotton and woolen goods began the latter part of the 18th century and has been continued. Lewiston is the chief centre of cotton manufacturing. There is a tendency now to remove the cotton manufacturing industry to the Southern States or nearer the supply of raw material. Biddeford and Saco are extensively engaged in manufacturing cotton goods. Woolen mills are scattered throughout the State. The oil-cloth industry was first started in Maine in 1845 by C. M. Bailey of Winthrop. Nearly all the factories are located near the coast, or in localities where abundant water power and good transportation lessen the cost of production and shipping. Lime and cement are important manufacturing products: large quantities of lime are made in Knox County.

The Paper Industry.— Samuel Waldo, Thomas Westbrook and Richard Fry were pioneers in the paper industry of Maine, having built a mill at Presumpscot Falls, Falmouth, in 1731, and a second mill at Stroudwater in 1733. At this time there were but three paper mills in the country, two being in Philadelphia and one in Milton, Mass. R. H. Gardiner and John Savels built the third mill about 1810. In 1816 Harris and Cox Brothers built a mill at North Yarmouth, and the same year another mill was built at Union by Josiah Day which was destroyed by fire in 1843. In 1623 George Cox and Company built a mill at Vassalboro which was burned in 1848 and not rebuilt. In 1845 Day and Lyon built a paper mill at "Congin" (now Cumberland Mills, Westbrook) which was burned in 1852, and was rebuilt by the firm of S. D. Warren and Company on the site of the old mill.

The paper industry in Maine received a great impetus by the introduction of wood pulp, and the State now ranks among the first of pulp-producing States. Wood pulp was first produced in this State in 1868–69. The second pulp mill was established in 1872 at Yarmouth. Sulphite pulp was first produced in Maine in 1889. Other sulphite, soda pulp and ground wood mills have followed in rapid succession since these dates.

The paper pulp industry has increased greatly during the past 10 years. There are now 113 pulp mills in the State, with aggregate

capital of $75,000,000, and an annual product valued at $70,000,000. Their daily output is about 5,000 tons, divided according to return 1916, as follows: For news, 1,319 tons; board wrap, 433 tons; book writ, 483 tons; special, 106 tons; chemical pulp, 980 tons; mechanical pulp, 1,657 tons.

The last public report gives the value of products of the following industries:

Manufacture of paper and wood pulp	$33,950,000
Lumber and timber products	26,125,000
Cotton goods	21,932,000
Woolen goods	18,490,000
Boots and shoes	15,509,000
Canning and preserving	7,689,000
Foundry and machinery	5,237,000
Flour and grist mill	4,507,000
Printing and publishing	3,438,000
Ship and boat building	3,062,000
Marble and stone work	2,565,000
Bakery	2,235,000
Leather	1,905,000
Wood, turned and carved	1,870,000
Metal products	1,689,000
Milk and cream products	1,301,000
Lime	1,215,000
Men's clothing	1,164,000

Political Divisions.— Maine is divided into 16 counties, as follows: Androscoggin, Aroostook, Cumberland, Franklin, Hancock, Kennebec, Knox, Lincoln, Oxford, Penobscot, Piscataquis, Sagadahoc, Somerset, Waldo, Washington, York. Pop. 742,371.

The principal cities of Maine are Portland, the metropolis, founded in 1632; Lewiston, Bangor, Bath, Augusta, Saco and Biddeford, each of which is treated in a separate article.

Banking Institutions.— There were in 1915 69 national banks doing business in this State, having capital stock of $7,765,000; surplus fund, $3,879,500; undivided profits, $2,756,231.48; loans and discounts, $39,240,311.42. Forty-eight savings banks, having 238,300 depositors and $97,679,538.74 savings deposits. Forty-six trust companies, having 157,390 depositors; capital stock, $3,690,400; surplus, $2,620,665.56; savings deposits, $52,605,216.62; assets, $69,707,-168.45. Total number of banks in State was 165. Thirty-seven loan and building associations; number of loans, 5,814; amount of loans, $5,709,062.59; total assets, $5,957,696.22.

Insurance Companies.— There are 61 insurance companies, with total assets of $22,-281,602.54.

Newspapers.— There are published 136 newspapers; 25 Republican; 8 Democratic; 19 independent; 5 religious; 3 temperance; 7 literary and educational; 3 agricultural; 36 local and 30 miscellaneous.

Finances.— On 1 Jan. 1917 the State Treasury reported a balance of $1,473,118 from 1916. The receipts in 1917 amounted to $8,185,344; payments amounted to $7,796,254, leaving a balance on 1 Jan. 1918 of $1,862,208. The bonded debt in 1917 amounted to $3,021,224.

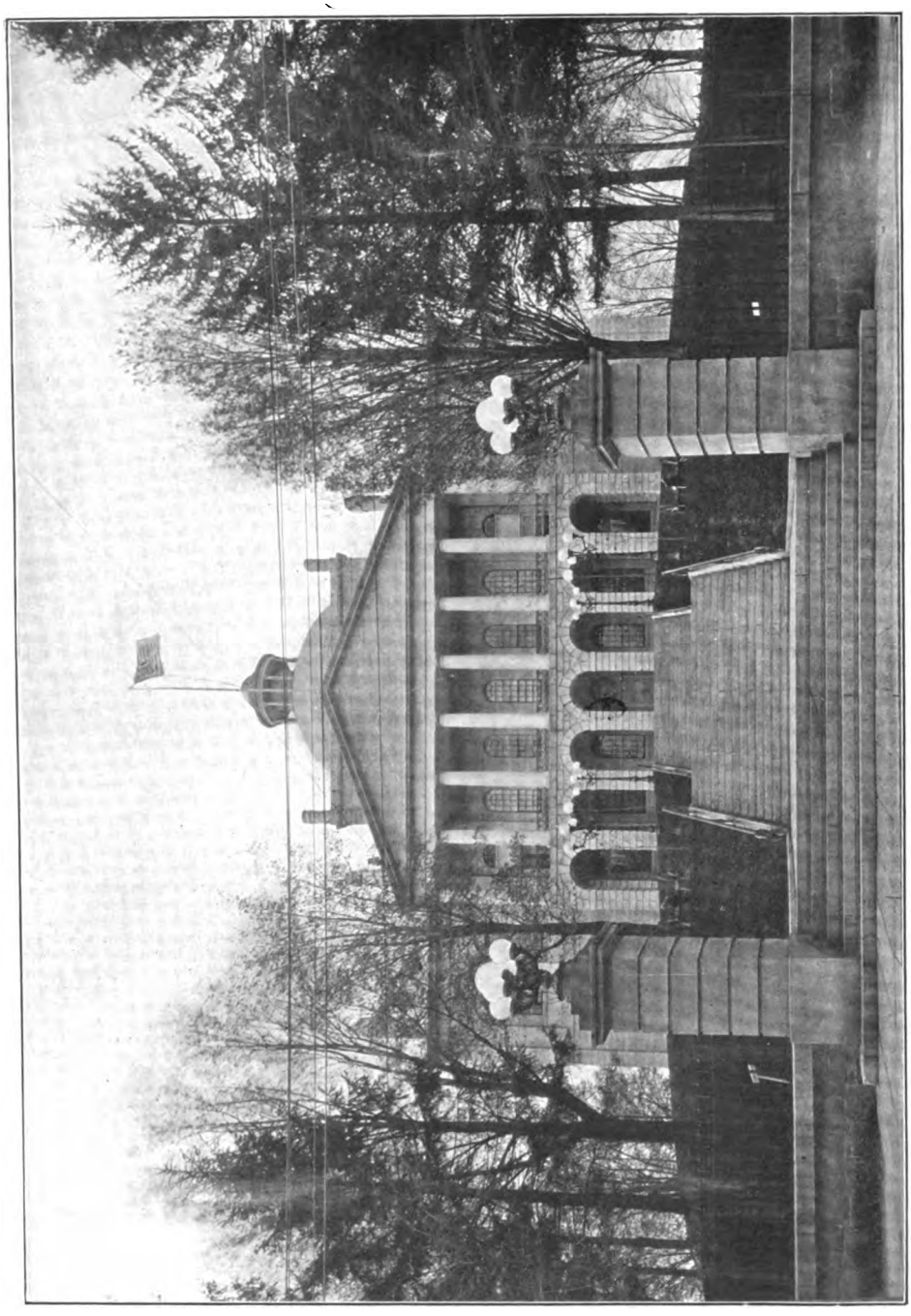
Government.— The State Constitution, under which the laws of the State are administered, was adopted by the people in town meetings held throughout the State December 1819. To amend or change the constitution it is necessary to have in favor a two-thirds vote of both houses of the legislature and a majority of the votes cast at the next biennial election or meeting of the people. A voter must be a citizen of the State; that is, no one has the right of suffrage but males, 21 years or over, citizens of the United States, who have resided in the State, county, town and voting district three months. Men of 21 years and over who are excluded from voting are paupers, Indians who are not taxed and persons under guardianship. Voters who are soldiers in the State militia or regular United States army may vote when serving outside the State. An amendment was made to the Constitution in 1884 to prohibit the manufacture and sale of intoxicating liquors. Severe penalties were attached to the violation of the law. State, city and town officials supervise the sale of liquors and permit such sales only for medicinal, manufacturing and mechanical purposes. The capital city is Augusta, on the Kennebec River in Kennebec County; its population is about 11,683.

Executive.—A plurality of the votes cast is necessary for the election of the governor, who holds office for a term of two years. His council consists of seven members elected biennially on joint ballot of the legislature, but any district prescribed for the election of senators can furnish only one councillor. The governor and council have power to grant pardons, commutations and reprieves, and to remit penalties. They also have the appointment of the judges of the Supreme Court. In case of vacancy in the office of governor, the president of the senate and speaker of the house are respectively in line of succession. The secretary of state and the treasurer are elected on joint ballot of the legislature and for two years.

Legislature.— The legislature is composed of a senate and house of representatives. There are 31 members of the senate and 151 members of the house, all elected biennially on the second Monday in September. They meet in session on the first Wednesday in January next following their election. The senators are elected from senatorial districts into which the counties of the State are divided. The representatives are elected from towns. All bills relating to revenues must originate in the house of representatives. The house has power of impeachment; but the senate conducts the trials of impeachments. The legislature may overcome the governor's veto by a two-thirds vote each of house and senate. The State has four congressmen.

Judiciary.— The eight judges who compose the Supreme Judicial Court are appointed for a term of seven years by the governor and council. The judge of the Superior Court of Cumberland County, which includes the city of Portland, the judges of the inferior courts, of municipal and police courts, are also appointed by the State executive and his council. The term of appointment of the judges of the inferior courts is seven years, and of the judges of municipal and police courts, four years. Probate judges are chosen by the people by election and for a term of four years. The attorney-general is elected on joint ballot of the legislature for a term of two years.

Local Government.— There is a general law providing for the election and duties of State, county, town and city officers, and penalties for non-fulfilment of their duties. The county officers are trial justices, county attorney, county commissioners, bail commissioners, judges of probate, sheriff, deputy sheriffs, registers of deeds, treasurer, clerk, commissioners



State Capitol at Augusta

of disclosure, stenographic commissioners and coroners. The town officers are selectmen, clerk, treasurer, collector of taxes, constables, road commissioners, school committees, health officer. Justices of the peace have jurisdiction throughout the State.

Militia.— The National Guard of the State numbers 1,382 organized militia, with 116 commissioned officers and 14 general staff officers. The unorganized reserve militia numbers 103,375 men — every able-bodied male citizen, aged 18 to 45, being included. The organized militia is both commissioned and enlisted.

Religion.— The denominations rank in numbers as follows: Baptist, 20,016; Protestant Episcopal, 4,800; Free Baptist, 12,963; Congregational, 21,483; Methodist Episcopal, 10,585; Universalist, 3,003; Unitarian, 4,500; Roman Catholic (population), 106,000; Lutheran, 1,445; Presbyterian, 423; Advent Christian, 5,000; Friends, 1,800; Swedenborgian, 173; Christian, 3,600; Disciples, 500; Church of God, 250. In 1900 there were 2,020 Evangelical Sunday schools, with 13,600 teachers and officers and 111,290 pupils. Sunday schools are maintained in connection with all the Roman Catholic churches.

Education.— By the last census the school population was 161,600; enrolment in public schools was 132,948; and average daily attendance, 97,132; enrolment in parish schools, 11,000. There were 4,218 buildings used for public school purposes, 6,447 teachers; school property valued at $4,699,475; receipts for the previous year, $1,507,345, and expenditures, $1,513,125. For the higher education there were 200 public high schools; 40 private secondary schools; 5 public and 2 private normal schools; Bowdoin College at Brunswick; Bates College at Lewiston; University of Maine at Orono; Colby College at Waterville; Westbrook Seminary at Deering; and Maine Wesleyan Seminary and Female College at Kent's Hill. There are academies at Hebron, Hampden, Lee, Bridgton and other towns. The illiterate of 10 years and over were 5.1 per cent, but this per cent would have been lower if the test had been made from the standpoint of those who could read or write in any language. A law of 1821 required that not less than 40 cents per capita of all inhabitants should be raised annually for school purposes. A public school fund was created in 1828 by setting apart 20 townships of lands belonging to the State. Moneys received from the United States for claims for services rendered in the War of 1812 were set apart for educational purposes. The compulsory law which covers the ages from 7 to 15 is strictly enforced. The district system has been abandoned and instead, the town system is in use. Since 1873 the State has aided towns where free academic instruction is given to the pupils. This instruction may be given in a high school within the town, or, since 1889, the town authorities may arrange for the education of its pupils with a high school outside the town. The number of free high schools receiving State aid in 1901 was 211. State institutes or summer schools for teachers are maintained by the State under the supervision of the State superintendent. The Indians are well provided with schools. The teachers' examinations and certificates are uniform and are in charge of the State. Strong efforts are made to have all the teachers normal school graduates. In 1903 about 25 per cent of those teaching in the schools were normal graduates.

Charitable Institutions.— There is a National Soldiers' Home at Togus, a United States Marine Hospital at Portland, State insane asylums at Augusta and Bangor, military and naval orphan asylum at Bath. There is also a law school at Bangor, a college of pharmacy at Orono, and agricultural experiment station, all connected with the university. There are State normal schools at Farmington, Castine, Gorham and Presque Isle. The State General Hospital, State Reform School, School for Deaf-Mutes, Maine Medical School and Eye and Ear Infirmary, Home for Aged and Indigent Women, Old Men's Home, two orphan asylums (Protestant and Catholic), Young Men's Christian Association and Young Women's Christian Association, located at Portland. City Hospital at Augusta, Central Maine at Lewiston, Eastern Maine General Hospital at Bangor, also at Bar Harbor, Old Town and Rockland. There are two hospitals, five orphanages and one Home for the Aged under the auspices of the Roman Catholic Church.

Penal Institutions.— The State prison is at Thomaston, the State Industrial School for Girls at Hallowell and the State Reform School about two miles from Portland. Prisoners in the county jails and convicts in the State prison are obliged to work and the products of their labor are sold in the markets. Contracts are sometimes made for the labor of prisoners in the jails of some of the counties. The work of the inmates of the reform school is usually on the farm and in workshops. The girls at the industrial school are taught domestic work and some trades.

History.— Maine is supposed to have been visited by the earliest explorers: Corte-Real in 1501 and Verrazano in 1524 reported a coast, the description of which corresponds with that of Maine. Gomez in 1525 sailed along the coast and named the Penobscot River, Rio de las Gamas, or Stag River. Sir John Hawkins, the famous Elizabethan seaman, explored the coast in 1565, and Sir Humphrey Gilbert in the voyage which cost his life was on his way to the Penobscot region, then known as Norumbega, to settle a colony under a patent from Elizabeth. Bartholomew Gosnold, an Englishman (one of the founders of Jamestown, Va.), explored the coast in 1602, and Maine was visited by Martin Pring, in 1603, by De Monts in 1604 and by Weymouth in 1605. The first attempt to settle on the territory was made by the French under De Monts, who, having received a patent from the French king, planted a small colony on Neutral Island in the Saint Croix River in 1604. The first colony settlement attempted by the English was at the mouth of the Sagadahoc by George Popham and Raleigh Gilbert in 1607. A fort was erected and a number of buildings and here the *Virginia*, the first vessel built in the country, was launched and subsequently formed one of the fleet of the Somers and Gates Colony in 1609. The colony at Sagadahoc was broken up by the death of Popham and great hardships endured by the colonists. They returned to England in the autumn of 1608. In 1613 French Jesuits established a mission on Mount Desert Island, but they were expelled by the English the next

year. In 1614 the coast was visited by John Smith, who found a few scattered settlers around Pemaquid Bay and on the island of Monhegan, off the coast of that part of the State now included in Lincoln County. In 1616 Sir Ferdinando Gorges, "The father of American Colonization," who had sent Pring and Popham to Maine, sent his agent, Richard Vines, to Saco to remain during the winter to explore the country and test the climate. In 1620 the king of Great Britain made a division of the grand charter of 1606 and granted to the Plymouth Company in England the whole country lying between 40° and 48° N., and to the Virginia Company the southern portion of the original patent. On 10 Aug. 1622, Gorges received a patent of territory between the Merrimac and Kennebec rivers, and the next year sent his son Robert as governor and lieutenant-general of the country, accompanied by several councillors and a minister of the Church of England to establish worship. In 1629 another division of lands was made giving to Sir Ferdinando Gorges the country between the Piscataqua and Kennebec rivers, to which he gave the name of New Somersetshire, and the remainder to John Mason. The first court in the province was convened by William Gorges, nephew of Sir Ferdinando, at Saco, 21 March 1636. Charles I granted to Gorges in 1639 a charter under which in 1641 Gorges established the first chartered city in the United States, under the name of Gorgeana, and constituted it the capital of the province. What was then Gorgeana is now York. Its original name was Agamenticus. A fort was built here and efforts made to protect the people against the Indians. From 1630 to 1632 settlements were commenced in Saco, Biddeford, Scarboro, Cape Elizabeth and Portland, all of which continued to prosper till the Indian War of 1675, when they were overthrown. Massachusetts claimed a portion at least of the territory of Maine on the ground that its charter included the lands as far north as three miles above the source of the Merrimac; but those to whom other charters had been given resented her interference. In 1677 Massachusetts purchased from the heirs of Gorges all their interest in the province of Maine. A new charter, issued by William and Mary, in 1691, combined the provinces of Massachusetts, Plymouth, Acadia, Maine and Sagadahoc into one province, called "The Royal Province of Massachusetts Bay." Maine was now a part of Massachusetts. Remote from the centre of white settlements of any great size, Maine suffered from attacks by Indians, especially during the French and Indian wars. When King Philip's War was ended there were within its boundaries only five settlements.

Among the first soldiers in active service in the Revolutionary War were men from Maine, who fought as Massachusetts troops. A regiment from Maine was present at Bunker Hill. The British fleet, in 1775, attacked and destroyed Portland and Falmouth. Off Machias was fought the battle in which the *Margaretta*, a British ship, was captured. At the close of the war Massachusetts still retained possession of the country and called it the "District of Maine." The people of Maine were divided in their allegiance to Massachusetts; one party desired to remain a part of the "Bay State" and another party wanted independent statehood. The separatist movement gained ground during the War of 1812. Maine was admitted into the Union as a State 15 March 1820.

The northeastern boundary continued a source of dissension with Great Britain, or between the people of Maine and New Brunswick until after the ratification of the Ashburton Treaty (q.v.), which practically settled the eastern boundary between the United States and Canada.

The legislation of the State has been usually marked by conservatism and sound judgment. In 1851 Maine adopted a prohibitory liquor law which has since been embodied in the constitution of the State. During the Civil War Maine furnished 70,107 soldiers, of whom 9,398 died during the war and a large number returned to their homes disabled invalids.

The State went Democratic at State elections (except 1840) till 1855, when Anson P. Morrill was elected governor as the candidate of the "Know-Nothing" party and also of those who favored a prohibitory law. From 1856 to 1910 the State has gone Republican except in 1878 and 1880, when the Democrats and Greenbacks on a fusion ticket elected their candidates. In 1879 a dispute arose as to the legality of the election of some of the members of the legislature and of the governor. For a time a disturbance was feared, but the militia preserved peace until the Supreme Judicial Court rendered a decision making the Republican candidates legal members of the legislature. The State has had no serious internal troubles except the "Know-Nothing" agitation in 1854-56 and the dispute about the legislature in 1879. In 1910 and 1914 the State went Democratic. The present governor (1919) is Carl E. Milliken. The Australian ballot law was passed in 1891.

Since Maine became a State there have been 48 different governors, some of whom have held the office for more than one term.

List of Governors.

William King	Democrat	1820-21
William D. Williamson (acting)*	"	1821
Benjamin Ames (acting)*	"	1821
Albion K. Parris	"	1822-27
Enoch Lincoln	"	1827-29
Joshua Hall (acting)†	"	1829-30
Nathan Cutler (acting)†	"	1829-30
Jonathan G. Hunton	"	1830-31
Samuel E. Smith	"	1831-34
Robert P. Dunlap	"	1834-38
Edward Kent	Whig	1838-39
John Fairfield	Democrat	1839-40
Edward Kent	Whig	1840-41
John Fairfield	Democrat	1841-43
Edward Kavanah	"	1843-44
Hugh J. Anderson	"	1844-47
John W. Dana	"	1847-50
John Hubbard	"	1850-53
William G. Crosby	Whig and Free-Soil	1853-55
Anson P. Morrill	Republican	1855-56
Samuel Wells	Democrat	1856-57
Hannibal Hamlin	Republican	1857
Joseph H. Williams (acting)	"	1857-58
Lot M. Morrill	"	1858-60
Isaac Washburn, Jr	"	1861-63
Abner Coburn	"	1863-64
Samuel Cony	"	1864-67
Joshua L. Chamberlain	"	1867-71
Sidney Perham	"	1871-74
Nelson Dingley, Jr	"	1874-76
Selden Connor	"	1876-79
Alonzo Garcelon	Democrat-Greenback	1879-80
Daniel F. Davis	Republican	1880-81
Harris M. Plaisted	Democrat-Greenback	1881-83
Frederick Robie	Republican	1883-87
Joseph R. Bodwell	"	1887
Sebastian S. Marble (acting)	"	1887-89

Edwin C. Burleigh	Republican	1889–93
Henry B. Cleaves	"	1893–97
Llewellyn Powers	"	1897–1901
John F. Hill	"	1901–05
William T. Cobb	"	1905–09
Bert M. Fernald	"	1909–11
Frederick W. Plaisted	Democrat	1911–13
William T. Haines	Republican	1913–15
Oakley C. Curtis	Democrat	1915–17
Carl E. Milliken	Republican	1917–21

* There were two acting governors, Williamson and Ames.
† Cutler and Joshua Hall, acting; there were two in 1829–1830.

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JAMES PHINNEY BAXTER.

MAINE, France, an old province having Normandy on the north, Brittany on the west and Anjou and Touraine on the south and Orléannais on the east. It corresponded to the modern departments of Sarthe and Mayenne. The ancient capital was Le Mans.

MAINE, The. A battleship of the United States navy, mysteriously destroyed by explosion in Havana Harbor, Cuba, on the night of 15 Feb. 1898. The revolt of the Cubans in 1895 against Spanish misrule had brought the island in 1897–98 to the verge of ruin. General Weyler had been recalled and General Blanco was sent as governor-general to endeavor to bring order out of chaos, but his plans failed and January 1898 witnessed serious disturbances. The American government, believing the lives and property of American citizens in Havana in danger, the *Maine,* which had been for some time at Key West, was ordered to Havana and arrived at that port 24 Jan. 1898. She was piloted into the harbor by an official pilot of the Spanish government and was moored to a government buoy. The usual official and international calls and salutations were exchanged between the Spanish authorities and the commander of the *Maine,* Capt. Charles D. Sigsbee, and outwardly there was no evidence of the impending disaster. The *Maine* carried 26 officers and 328 men, all of whom were on board when the explosion took place, except an assistant engineer, two naval cadets and a gunner. Two officers and 250 men were killed at once and 8 men died afterward in hospital. Only 16 of the crew wholly escaped injury. Of the dead, 166 were buried in Colon Cemetery, and 25 at Key West. In 1899 the dead buried at Colon Cemetery were brought to the United States and buried at Arlington with military and naval ceremonies. A court of inquiry, Capt. W. T. Sampson presiding, was instituted and after a month's investigation expressed the opinion that the vessel was destroyed by the explosion of a submarine mine, but responsibility could not be fixed upon any person or persons. Shortly afterward war was declared. (See UNITED STATES — THE WAR WITH SPAIN).

There was a very general demand throughout the United States that the *Maine* should be raised, and on 9 May 1910 Congress authorized operations and the matter was placed in charge of the War Department, and assigned specifically to the engineer corps of the army. An elliptical coffer-dam, composed of a series of huge contracted cylinders that were constructed of interlocking steel piles and filled with mud and stone, was placed around the wreck. It was a wonderful piece of engineering, reflecting great credit on every army engineer connected with its inception and execution. The coffer-dam was completed 5 June 1911, and the entire wreck exposed 2 November following. A joint army and navy board, of which Rear-Admiral Charles E. Vreeland was president, was then sent to Havana to reinvestigate the wreck. It reported 15 Dec. 1911, confirming the verdict of the Sampson court except in the non-essential detail that the centre of the explosion was a little farther aft than was reported by that court. The after half of the hull, all that was not shattered, was floated 13 Feb. 1912, 14 years, lacking two days, after the *Maine's* destruction. On 16 March 1912 this relic of the once powerful battleship was towed to sea, with attendant ceremonies, afloat and ashore, and sunk in 600 fathoms of water. Concurrently 34 coffins, estimated to contain the bones of 64 of the *Maine's* dead, were placed on board an American war vessel and dispatched to Arlington, where, on 23 March, they were buried in the *Maine* plot.

MAINE, University of, The, a coeducational institution, located at Orono, Me., on the Penobscot River, eight miles above Bangor. it is one of the institutions that owes its existence to the Act of Congress of 1862, commonly known as the Morrill Act. The 210,000 acres of land which were, by this act, conveyed to the State for the purpose of establishing a college of agriculture and mechanic arts, were sold at a low price, and there resulted an endowment for the college of $118,300. The income of the institution is derived from interest on this endowment fund and on other bequests of private nature, an annual appropriation by the State, student fees and the income of the second Morrill Act of 1890. The total income from all sources for the year 1915, exclusive of special appropriations for buildings, was about $267,416.78.

From the day of opening, in. 1868, when 12 students enrolled themselves, the institution has prospered. Until 1897 the institution was known by the name "State College of Agriculture and Mechanic Arts." The legislature of 1897 changed the name to the "University of Maine." The number of students (1915–16) was 1,269. The faculty number 154. There are 30 departments in which instruction is given.

These departments are divided into colleges of Arts and Sciences, Agriculture, Technology and Law.

In the College of Arts and Sciences instruction is given in the departments of Greek and classical archæology, Latin, French, German, education, English, Spanish and Italian, philosophy, economics and sociology, history, mathematics and astronomy, physics, chemistry and biology. In the College of Agriculture instruction is given in agriculture, animal, dairy and poultry husbandry, forestry, home economics and horticulture. In the College of Technology instruction is given in chemistry, chemical engineering, civil engineering, mechanical engineering, electrical engineering and pharmacy. The degree of B.A. is given for the completion of courses in the College of Arts and Sciences. The degree of B.S. is given for courses in the colleges of Agriculture and Technology. The degree of LL.B. is given those who graduate from the College of Law.

Great interest is taken by the student body in all branches of athletics. The students maintain an excellent band, an orchestra, glee and instrumental clubs and debating clubs. Twelve fraternities maintain houses of their own, in which they live as families and frequently entertain their friends. The College of Law, located in Bangor, was established in 1898. It has an excellent library, maintains a three-year course and has a few more than a hundred students, a large percentage of whom are college graduates.

MAINE BOUNDARY TREATY. The year 1910 witnessed the final settlement of the long-standing dispute as to the boundary line between Maine and New Brunswick. Secretary of State Knox, acting for the United States, and Ambassador Bryce, on behalf of Great Britain, signed a treaty which establishes the exact boundary of Maine for all time.

At the close of the Revolutionary War in 1783 the first attempt was made to fix a satisfactory boundary, but it resulted only in hopeless dissatisfaction. Ever since that time the matter has remained one for ceaseless wrangling and dispute. Scarcely a diplomat has been sent to this country from England but has been called upon to familiarize himself with the Maine-New Brunswick boundary situation; while the State Department of this country has gone over the ground so many times that that performance had almost come to be regarded as one of the regular duties of the department.

Most boundary lines are fixed by nature; those which are not do not as a rule amount to a great deal, and an amicable settlement can usually be reached at once. With the Maine-New Brunswick line, however, neither of these conditions have ever applied, particularly in that part which has so long been in dispute. This particular line runs through Passamaquoddy Bay, along the little islands at the mouth of the Saint Croix River. As a result of its indefinite character there has been endless dispute and strife among the fishermen who frequent these parts; dispute which had had an industrial significance since both the Eastport and Lubec canneries have sent their men to this point, and it makes a vast deal of difference whether they are fishing in American or Canadian waters.

The source of all the trouble was the looseness with which the first treaty, that of 1783, was drawn up. Article II of that document reads: "And that all disputes which might arise in future on the subject of the boundaries of the said United States may be prevented, it is herein agreed and declared that the following are, and shall be, their boundaries, viz.: From the northwest angle of Nova Scotia, viz: That angle which is formed by a line drawn due north from the source of the St. Croix River to the Highlands; along the said Highlands which divide those rivers that empty themselves into the river St. Lawrence from these which fall into the Atlantic Ocean, to the northwestermost head of the Connecticut River," etc.

Thus, while the Saint Croix was plainly named as the beginning of the eastern boundary, the only point mentioned was the source of the river, and not a word was said about its mouth or the numerous islands of the great bay into which it empties. Moreover, there arose at once the questions as to what was the Saint Croix River. The trouble loomed up at the very start. The first action toward a settlement was taken in 1794 when John Jay was charged to adjust the matter. All he was able to accomplish, however, was a provision in his treaty of that year for the appointment of three commissioners to determine just what was the Saint Croix River. These commissioners met at Halifax in 1798 and determined the river, but neglected to mention its source and made no disposition of the islands at its mouth. Subsequently there were treaties, conventions and declarations between the United States and Great Britain relative to this subject in 1814, 1818, 1827, 1842, 1846 and in 1870, but in every instance there was something still left to be adjusted around the mouth of the river.

The Treaty of Ghent in 1814 provided for commissioners to settle the matter and they decided that Moose, Dudley and Frederick islands belonged to the United States, while all the other islands, including Grand Menan, were the property of Great Britain. This was very good so far as it went, but it left unsettled the status of several small islands in the Saint Croix and of the line itself through the bay. The channel thus remained in dispute.

In addition to this, trouble soon arose over the boundary line northward and westward from the source of the Saint Croix. The original treaty had been exceedingly vague on this subject, and finally in 1827 the king of the Netherlands was named as referee to conclude the dispute. After failing for a long time to satisfy either party with any of his suggestions, he drew a line to suit himself, awarding part of the disputed territory to Maine and part to New Brunswick. The United States rejected this arrangement, while in the meantime the disturbances on the border kept becoming more and more serious. Operations of the 1830 census takers in the contested area created much feeling, and eight years later an American lumber dealer was thrown into jail by New Brunswick officials — the act having much to do with the precipitation of the Aroostook war. Although no blood was spilled in this it came very near to maturing into a third war with England. A joint occupation was agreed upon as a temporary compromise, before Daniel Webster and Lord Ashburton came together in 1842

and drew up the famous treaty which settled all dispute as to that particular part of the boundary line.

It has been related as an historical fact that in these negotiations both nations withheld maps which were unfavorable to their claims. The Americans had one which had been discovered but a short time before in Paris, and was supposed to have been drawn up by Benjamin Franklin, while in the possession of the English was one made by Richard Oswald, who was one of the commissioners who negotiated in the treaty which gave the United States its independence. Later both nations showed these maps to their own people in evidence of how conclusively they had got the best of the bargain. Up to the present time, however, the United States has always regarded the signing of this treaty of 1842 as a diplomatic triumph.

The treaty of 1842, however, made no mention of any part of the boundary south of the monument which had been erected at the source of the Saint Croix, and until Secretary Knox and Ambassador Bryce signed their treaty of 1910 the lower part of the line in places was still contested. But with the signing of this latest treaty and the final settlement of the whole chaotic matter no point now remains between the United States and Canada which is in the slightest dispute.

MAINS. See ELECTRICAL TERMS.

MAINTENANCE, in its legal signification, the interference by a person in litigation in which he is not primarily interested, by assisting either party with money or otherwise. It includes champerty (q.v.), which consists of maintenance for reward or for a share in the proceeds of the litigation promoted. An agreement of this kind is illegal and void and at common law is punishable as an offense tending to obstruct justice. To-day where the common law prevails the wrongful intention with which the assistance is given is regarded as the gist of the offense. In many jurisdictions maintenance is no longer recognized as a criminal offense and in many States is not regarded as a civil cause of action by the injured party against a maintainor of the suit against him. See CRIMINAL LAW and consult the authorities referred to under that title.

MAINTENON, măn-tē-nôn, **Françoise d'Aubigné, MARCHIONESS DE, French queen:** b. Niort, Poitou, 1635; d. Saint-Cyr, 1719. Her birthplace was the prison in which her parents were confined because of religious trouble. After her father's death in her 10th year she became the ward of her guardian and aunt, Madame de Neuillant, who gave her a somewhat limited education and through whose efforts she became converted to the Catholic faith at about the age of 14. She was then returned to her mother, whose income was insufficient for the child's support. Her humiliation did not embitter her bright and cheerful disposition, however, and when at 16 the famous wit and man of letters, Scarron, deformed, old and infirm as he was, became her husband, and she was soon the centre of the clever literary people who frequented his house. When Scarron died, her good sense and delightful disposition recommended her to many friends, who pointed her out to Louis XIV as a fitting person to take charge of the education of the children born to him by Madame de Montespan. She undertook the office of governess to the royal children, won their affection and respect as well as that of the king, who married her in 1685 when she was 50 and he 47. There can be no doubt that she exercised a beneficent influence over the king's private life. She was undoubtedly disinterested and charitable, her character above stain in a profligate age, and her mind clear and resolute in pursuing the course she thought to be right. She survived the king four years and died at the nunnery at Saint Cyr which she had changed into a place of education for the poor daughters of families, having enjoyed to the end all the honor and position of a royal widow. Consult Blennerhassett, C. J., 'Louis XIV and Madame de Maintenon' (New York 1911); Dyson, C. C., 'Madame de Maintenon: Her Life and Times, 1635–1719' (London 1910); Geffroy, 'Mme. de Maintenon d'après sa correspondence authentique' (Paris 1887); Noailles, 'Histoire de Mme. de Maintenon' (ib. 1848–58); Pilastre, E., 'Vie et caractère de Mme. de Maintenon' (ib. 1907).

MAINZ, mīnts, Germany, a town in the grand-duchy of Hesse-Darmstadt, on the left bank of the Rhine, opposite the mouth of the Main, 20 miles by rail southwest of Frankfort. It is a fortress of the first rank, an episcopal see and a river port. The town rises gradually from the Rhine in the form of an amphitheatre. A railway bridge spans the Rhine a little above its junction with the Main, and a stone bridge connects with the opposite suburb of Kastel. A handsome quay, 330 feet wide, extends along the Rhine for a considerable distance, and large modern harbors have been constructed. The principal edifices are the cathedral, recently restored, a vast building of the 11th century; the former electoral palace, now containing the city library (230,000 vols.), picture gallery, museum of Roman and Roman-German antiquities, etc., the old collegiate church of Saint Stephen, occupying the highest site in the town, the church of Saint Peter, the German House, or grand-ducal palace with the arsenal adjoining, the courts of justice, the government buildings, public hall, two new concert halls, central railway station, etc. One of the most interesting objects in the town is the house of Gutenberg which contained his first printing office. A bronze statue of Gutenberg, by Thorwaldsen, stands in an open space near the theatre. The great open-air resort is the *Neue Anlage,* outside the gates, consisting of extensive public gardens, and commanding fine views of the town and surrounding district. The manufactures consist chiefly of leather, furniture, hardware, carriages, carpets, tobacco, beer, chemicals, musical instruments, gold and silver wares, machinery, soap, hats, etc. The trade, particularly transit, is extensive. The principal articles are Rhenish wine, corn, flour, oil, coal and wood. Mainz owes its foundation to a Roman camp which Drusus pitched here. On the decline of the Roman power it was almost entirely destroyed, but was afterward rebuilt chiefly by Charlemagne, and became the first ecclesiastical city of the German Empire, of which its archbishop-elector ranked as the premier prince. Pop. 110,634.

MAIPO, mī'poo, or **MAIPU,** a river in Chile, having its rise in the Andes Mountains and flowing almost due west into the Pacific Ocean. It is 120 miles in length. The falls and rapids furnish valuable water power, which has not been utilized to any great extent. The city of Santiago is a few miles north of the river. On 5 April 1818 was fought on the banks of the Maipo the battle which decided the independence of Chile.

MAIR, mār, **Charles,** Canadian writer: b. Lanark, Ontario, 21 Sept. 1840; d. 1906. He was educated at Queen's University, Kingston, and entered journalism. He aided in quelling the Riel insurrections and was one of the organizers of the "Canada First" party. Among his works are 'Dreamland and Other Poems' (1868); 'Tecumseh,' a drama (1886).

MAISON CARRÉE, mā-zoń' ka'rā, Roman temple at Nimes, France, the most perfect of its type remaining. It was probably built early in the Christian era, its inscription dedicating it to the adopted sons of Augustus, Gaius and Lucius Cæsar, although by some authorities its date is placed at about the 2d century. It is built on the plan of the Parthenon although its dimensions are smaller. It stands on a podium 11 feet high, measures 40×82 feet and is entered by a flight of 15 steps. There are 30 columns, of which 20 are in the side and rear walls while 10 form the portico. The temple now houses collections of antique sculpture and coins.

MAISONNEUVE, mā-zŏń-nèv, **Paul de Chomedey,** SIEUR DE, French colonizer: b. Champagne, France; d. Paris, 9 Sept. 1676. He enlisted in the French army at 13 and later organized a band of colonists with whom he landed at Quebec in 1641. In 1642 he founded Montreal and was for 22 years its governor but was absent for a time in 1652 when he returned to France to conduct to America a new party of settlers. He displayed great administrative ability, but through the jealousy of De Mésy, governor-general of Canada, was in 1664 recalled to France by De Tracy. Though no charges were made against him he found no possibility of reinstatement in office and resigned in 1669.

MAISTRE, mā'tr, **Joseph Marie,** COMTE DE, French philosopher and savant: b. Chambéry, 1 April 1754; d. Turin, 26 Feb. 1821. He was of French extraction and was a senator of Piedmont at the time of the French invasion (1792). He left his country in consequence of that event, and afterward followed his king to Sardinia. In 1803 he was sent Ambassador to Saint Petersburg, and returned finally to Turin in 1817. De Maistre was familiar both with Greek and Latin literature, and his writings in French have obtained the highest praise of critics. He was a conservative in politics, religion and philosophy, a supporter of absolute monarchy and of the infallibility of the Pope. His 'Mémoires politiques et correspondance diplomatique' (published posthumously, 1858), however, shows him in the light of a much more discerning and less uncompromising politician than his formal treatises, and indicates a large and liberal appreciation of the revolution which he opposed. As a diplomatist he exerted himself to effect the restoration of all his former possessions to his master, and to obtain the transfer of Genoa. Among his political writings are his 'Eloge de Victor Amadée III'; 'Considérations sur la France' (1796); 'Essai sur le principe générateur des constitutions politique' (1810), in which he maintains the divine origin of sovereignty; 'Du Pape' (1819); 'Soirés de Saint Petersborg' (1821; new ed., 1888); 'De l'Eglise gallicane' (1821–22); and 'Du Congès de Rastadt' (the last with the Abbé de Padt). 'Quatre chapitres inédits sur la Russie par le comte Joseph de Maistre' was published by his son in 1859. Consult Descostes, 'Joseph de Maistre avant la révolution' (Paris 1893); Lescure, 'Joseph de Maistre et sa famille' (ib. 1893); Paulhan, F., 'Joseph de Maistre et sa philosophie' (1893).

MAISTRE, Xavier DE, French soldier, essayist and novelist, brother of Joseph de Maistre (q.v.): b. Chambéry, October 1763; d. Petrograd, 12 June 1852. He served in the Piedmontese army when very young, and his literary career began with his writing, 'Voyage autour de ma chambre' ('Journey Around My Room,' 1794), while in prison at Turin for participation in a duel. When Savoy was annexed to France he went to Russia and there secured a commission in the army, where he rose to the rank of major-general. He lived for a time in Naples after the restoration of the Piedmontese dynasty, but eventually returned to his adopted country and died there. His style was graceful and his work was marked by strong delineation of character and exceptional descriptive power. (See JOURNEY AROUND MY ROOM). He also wrote 'Le Lépreux de la cité d'Aoste' (1811); 'Les prisonniers du Caucase' (1815); 'La Jeune Sibérienne' (1815); 'Expédition nocturne' (1825). His complete works were published in three volumes (Paris 1825).

MAISUR, mī-soor'. See MYSORE.

MAITIN, mī'tăn, **José Antonio,** Venezuelan poet: b. Porto Cabello, 1798· d. Choroni, Venezuela, 1874. In 1824 he returned from Havana to his own country whence he had fled on account of persecution, and made his home in the valley of Choroni. In 1844 his best poems were collected and published with the title 'Echoes from Choroni,' and in 1851 a collected edition of all his works appeared.

MAITLAND, Edward, English mystic and writer: b. Ipswich, 27 Oct. 1824; d. Tonbridge, 2 Oct. 1897. He was educated at Caius College, Cambridge, and was destined for the ministry, but declined to take holy orders because of his incompatible religious beliefs. He was one of the "Forty-niners" in California and later went to Australia where he became a commissioner of Crown lands. He was married and widowed in Australia and in 1857 returned to England where he engaged in literary work of an humanitarian order. He made the acquaintance of Mrs. Anna Kingsford in 1874 and with her crusaded against materialism, vivisection and the use of animal food. In 1876 he announced that he had acquired a new sense which enabled him to see the condition of peoples' souls, as well as those of trees and animals, and likewise revived his memory of his own previous incarnations. He joined the Theosophical Society in 1883, but shortly afterward withdrew from

it and with Mrs. Kingsford founded the Hermetic Society which was of mystic rather than occult character. After the death of Mrs. Kingsford in 1888 he maintained that they remained in communication. In 1891 he founded the Esoteric Christian Union. He wrote for the *Spectator* and the *Examiner;* reviewed books for the *Athenæum;* and collaborated with Mrs. Kingsford in writing 'The Key of the Creeds' (1875), and 'The Perfect Way; or the Finding of Christ' (1882). Author of 'The Pilgrim and the Shrine' (1867); 'The Higher Law' (1869); 'By and By: an Historical Romance of the Future' (1873); 'Clothed with the Sun: Being the Book of the Illuminations of Anna (Bonus) Kingsford' (1889); 'The New Gospel of Interpretation' (1892); 'Anna Kingsford, Her Life, Letters, Diary and Work, By her Collaborator, with a Supplement of Post-Mortem Communications' (2 vols., 1896). After the completion of the 'Life' of Mrs. Kingsford, which, like most of his writings, was largely autobiographical, his mental powers failed rapidly.

MAITLAND, Frederic William, English historian: b. London, 28 May 1850; d. 19 Dec. 1906. He was graduated from Trinity College, Cambridge, and studied law; in 1884 was made reader of English law at Cambridge and from 1888 was professor of the same branch there. He read widely on legal history. founded the Selden Society in 1887 for the study of the history of English law and was a generally recognized authority. Among his works are 'Gloucester Pleas' (1884); 'History of English Law,' with F. Pollock (1895); 'Canon Law in England' (1898); 'English Law and the Renaissance' (1901), etc.

MAITLAND, J. A. Fuller. See FULLER-MAITLAND, J. A.

MAITLAND, Sir Peregrine, British soldier: b. Hampshire, England, 1777; d. London, 30 May 1854. He enlisted in the army in 1792 and was promoted rapidly, serving in Spain and at the battle of Waterloo, where he was a major-general. In 1818 he was appointed lieutenant-governor of Upper Canada and in 1828–34 was governor of Nova Scotia. He was made lieutenant-general in 1830 and commanded the Madras army, 1836–38. From 1843–47 he was governor and commander-in-chief at the Cape of Good Hope.

MAITLAND, Sir Richard, Lord Lethington, Scottish poet and antiquary: b. Scotland, 1496; d. Edinburgh, 20 March 1586. He was educated at Saint Andrews and was one of the great lawyers of his day, and although he became blind in 1561 was nevertheless made a member of the Privy Council, and in 1562 keeper of the great seal. His manuscript collection of early Scottish poetry is preserved at Magdalene College, Cambridge. A selection from his collection, together with his own poems, was published in 1786, and his poems were reprinted in 1830 by the Maitland Club, a literary organization founded in his honor in Glasgow in 1828.

MAITLAND, William, Scottish statesman: b. Scotland, about 1528; d. Leith, 9 June 1573. He was a son of Sir Richard Maitland, Lord Lethington (q.v.), and was educated at Saint Andrews and on the Continent. He early entered political life and was interested in the Knox reform movement; in 1558 he was appointed Secretary of State by Mary of Guise, and is commonly called "Secretary Lethington." He was one of the commissioners who concluded the Treaty of Berwick and in 1560 was speaker of the Scottish Parliament. He was one of Mary's ministers on her return from France, but was suspected of having betrayed her to Queen Elizabeth. In 1563 Maitland conducted a prosecution for treason against Knox whom he had earlier supported, and in 1565 he became lord of the sessions but was removed from office for implication in Rizzio's murder; he was also connected with the murder of Darnley. He contrived Mary's escape from Lochleven but fought against her at Langside. After the assassination of Moray he became the leader of the queen's party and was active in her support. He joined Kirkcaldy at Edinburgh Castle, and encouraged him to hold out until the last. He was taken prisoner at its surrender and died in prison. Consult Skelton, 'Maitland of Lethington and the Scotland of Mary Stuart' (1887–88).

MAITLAND, Australia, town, in Northumberland County, in New South Wales, on the Hunter River, about 119 miles north of Sydney by rail. It is connected by railroad with Newcastle, about 15 miles distant. The Hunter River divides the town into East and West Maitland, two distinct municipalities, West Maitland being the larger. The Hunter River frequently overflows its banks and floods the town and surrounding country. Although serious devastation results, the soil has been enriched by this flooding, and so fertile is this section that Maitland is called the "garden of New South Wales." Grapes, grains, tobacco and vegetables grow in abundance. Large coal fields are near the town. Considerable manufacturing is carried on, especiallv in West Maitland. Pop. of East and West Maitland, 11,313.

MAIZE. See CORN, INDIAN.

MAIZEROY, René, Baron (real name René Jules Jean Toussaint), French novelist: b. Metz, 2 May 1856. He was educated at the Jesuit College of Saint Clement, the Toulouse Lycée and the Saint Cyr Military School, becoming second lieutenant in the 53d regiment of Infantry. He resigned from the army in 1881 and entered upon a literary career. He contributed to *Le Gaulois, Figaro, Gil Blas, La Vie Moderne* and *Clarion,* and became a voluminous writer of fiction, also producing several pantomimes, ballets and dramas. Author of 'Le Capitaine Bric-a-brac' (1880); 'Souvenirs d'un officier' (1888); 'L'Adorée'; 'P'ti'-Mi'; 'Le Reflet'; 'En Volupté'; 'Glorita, fille et marquise'; 'Yetto, mannequin'; 'Ville d'Amour'; 'La Mer' (1895); 'La Remplaçante' (1906); 'L'Amour en danger' (1912), etc.

MAJESTY (Latin, *majestas*). *Majestas,* in a collective sense, was used in republican Rome to signify the highest power and dignity, the attribute of the whole community of citizens, the *populus.* The *majestas* was also ascribed to the dictator, consul, and even Senate, though in the case of the last the word *auctoritas* was used in preference. At a later period,

under the Roman emperors, *majestas* was the name of the imperial dignity, whilst that of a magistrate was called *dignitas*. To kings the attribute of majesty was given much later. The courtiers introduced the title into France under Henry II. In the Treaty of Crespy (1544) Charles V is styled *imperial*, Francis I *royal majesty;* and in the Peace of Câteau-Cambrésis (1559) the titles of *most Christian and Catholic majesty* are found for the first time. In England Henry VIII first adopted the title *majesty, grace* and *highness* being the titles formerly employed. At present this title is given to all European emperors and kings.

MAJOLICA AND MEZZA-MAJOLICA. Spelled also maiolica. It is generally claimed that the word was derived from the island of Majorca, whence the first pieces of this ceramic ware were imported to Italy. The term majolica has become a very confused and indefinite expression and used by writers with different meaning. The term, in its first application, referred only to the early Italian lustre-ware made (15th century) with transparent silicious glaze and outer surface of metallic sheen in imitation of the lustre-ware of Hispano-Moresque creation. Later, the early enamel-covered and color-decorated wares of Italy were called majolica regardless of metallic lustre surface, and the lustre-ware having Oriental style of form and decorative treatment was termed *mezza-majolica.* But the term majolica has in modern times been vulgarized into a broader definition by the public including practically everything in ceramics having glaze coating and painted decoration. Leading experts retain the more distinctive terms. Lustre decoration consists of imparting a metallic or pearl-like (*nacreous*) sheen to the outer surface of the ceramic ware by coating over the already decorated and fired piece with a thin layer of a pigment containing either gold, silver, copper, etc., and then firing under moderate heat. The effects are very delicate and beautiful and are known, according to the different sheens produced, as ruby (rubino), gold, silver, mother-of-pearl (madreperla), etc.

Mezza-Majolica.— The earliest production of this ware was in Persia and Turkey, but it is only in quite recent years that the actual fabriques have been located. To this Turkish ware belong the pieces heretofore labeled «Lindos» and «Rhodesian» ware from the location of the sites where examples had been excavated. The actual sites of production now satisfactorily proven and dates of discovery of these prototypes of mezza-majolica are as follows: Rekka (1896), Sultanabad (1905), Rhages, quite recently. The ware formerly termed «Siculo-Arabian» is now said to have had its home in Syria or Egypt, and the so-called «Rhodesian» ware in Osmanli-Turkey. The latter has most brilliant coloring (blue, grayish-black, green, etc., and, later, red) and ornamentation as well as most masterly technique in execution. At Fostat, in Lower Egypt, lustred and unlustred ware was produced before the 12th century. We find among the Persian examples cylindrical vases, pear-shaped bottles, plates, tiles, bowls, mosque lamps, etc. In the Persian polychrome enamel-decorated ware of the 17th century we find dark blue, yellow, green, purple, red, black, turquoise, all on very white ground, with typical Persian decoration (arabesques, flowers, turbaned heads, figures, etc.). Such 17th and 18th century ware was produced in northeast Persia, Bokhara, Kirman, Kashan, etc. Practically all this ware had its body coated (*engobe*). The Mohammedan tiles (known in Arabic as *rojolos*) were very beautiful and utilized in covering outside spaces of the mosques as well as the internal wells. Grand effects are those presented in the Blue Mosque, at Tabriz (15th century) and at Khoda Bende Khan shrine at Sultanieh (14th century), etc. Spain produced glazed ware as early as the 8th century (mosque of Cordova has examples). Through its Moorish artists Spain produced lustre-ware, an industry doubtless derived from Oriental sources, at an early date, Calatuyad having both domestic and export trade in the 12th century. This same gold-lustre ware was produced in Malaga during the 14th century, and, by the end of the 15th century, Manises, near Valencia, was the centre for the gold-lustre ware industry, retaining its pottery kilns to the present day. The yellowish tin-glaze on Spanish majolica covers both the inside and outside of vessels. Color is mostly cobalt blue, but coats-of-arms show a sparse use of brown and violet. The great Alhambra vase and pieces of a similar character belong to the 14th century and were produced in Granada. This Hispano-Moresque art was continued by the Christians after the Moors were expelled, but it soon became decadent in merit. The Spanish colored glazed tiles (*azulejos*) had the centre of that industry, in the early period, in Seville, but no lustre-ware appears to have been made there. In the Spanish decoration predominating motifs were plant life, Arab scripts, figures of animals and concentric circles. The frequent display of heraldic coats-of-arms shows Christian tendency later. The ware consisted mostly of dishes, basins, ewers, vases, apothecary pots (*albarellos*), etc. Talavera, in the 16th to 18th centuries, produced tin-enameled ware prolifically. For some time, at least, Paterna, Quarte, Villelonga, Alaqua, Carcer, Moncada, etc., produced gold-lustre ware. The quality of the gold-lustre remained good into the 17th century though other ware became inferior long before. And the modern lustre shows coppery effect instead of the earlier pale gold tones. Alcora produced the best pieces. Sicilian (Siculo-Arabian) mezza-majolica ware dates back to the 9th century.

Majolica.— Italy imported her lustre-ware from Spain and the island of Majorca, apparently, till about the 15th century, but, by the middle of the 14th century she had started her own mezza-majolica fabriques and by the first half of the 16th century the industry was in its zenith, to become thoroughly decadent by the end of the 16th century. The recent discovery in Faenza of the piece decorated with Astorgio Manfredi (1393–1405) coat-of-arms and the documentary statement of the contemporary writer Pietro del Bono (1330) make it appear that Italy was producing opaque underglaze majolica in the 14th century besides her silicious transparent colored glazes (mezza-majolica). By the 16th century Italian majolica was being made in Pesaro, Urbino, Gubbio,

MAJOLICA

1 The Rape of Proserpine, Urbino Gubbio Lustres (Italy 1544)
2 The Death of Achilles, Urbino (Italy 1540-1545)
3 Coat of Arms of the Medici of Florence, Hespano Moresque Valencia (1479-1500)
4 Bowl, Rhages, Persia (13th Century)

Caffagiolo, Treviso, Bassano, Nove, Padua, Candiana, Verona, Milan, Venice, Lodi, Turin, Genoa, Savona, Arbisola, Ferrara, Modena Reggio, Scandiana, Sassuolo, Siena, Pisa, Asciano, Monte Lupo, San Querigo, Castel Durante, Citta di Castello, Bagnolo, Faenza, Forli, Rimini, Ravenna, Bologna, Deruta, Fabriano, Spello, Viterbo, Rome, Capo di Monte, Naples, Grotaglia, Castelli in Abruzzo, Palermo and Catala Girone. Lustre-ware was produced only at Pesaro, Deruta, Gubbio, Urbino and Castel Durante; a few pieces made at Caffagiolo and elsewhere were experimental. The body of old Italian majolica is a buff-colored clay.

Gubbio.— This ware is famous for its lustre pieces. Those emanating from the studio (botega) of "Maestro Giorgio" (early 16th century) are all elaborately decorated and have a lustre surpassing all other wares. His metallic reflecting surfaces, Solon says, "pass from bluish-purple to ruby-red, from golden-yellow to emerald-green," his *madre-perla* is absolute perfection. Few Gubbio pieces bear any marks, but besides the before-mentioned Giorgio Andreoli were other Andreolis — Salembini, Giovanni and Vinzentio. The Gubbio fabrique was in decadent condition by 1551. The characteristic decoration of the ware consists of grotesques (*groteschi*), which the contemporary Picolpasso terms "a candelliere"; they contain artistically executed large scrolls (in yellow or brown) terminating in the heads of sea-horses, monsters, birds, etc., with cherub heads intermingling; trophies with mottoes surround busts. As centre-piece appears a genre or other scene. Human figures show weak drawing.

Urbino.— Under the powerful protection of Duke Guid'Ubaldo II this town took a leading position in the second half of the 16th century with its flourishing majolica fabrique and its remarkably artistic creations. As these pieces were produced for presentation to grandees and even sovereigns perfection of detail and talented elaborate composition were undertaken. So high is the artistic merit of some of the painting that it is claimed to have been from the designs of the great Raphael himself. Three artists are prominent in this work: Guido Durantino (or Guido Fontana), Francesco Xanto da Rovigo (both of these signed in full), the latter copied, with modifications, engravings after Raphael; and Orazio Fontana (son of Guido), whose drawings are characterized by a light outline in the blue color that was utilized in the flesh tints. The Fontanas did also peculiar grotesque decorations on a white background with very graceful effect, some having medallions of figures as centre-pieces. The Patanazzi family (end of the 16th century) were the last of the majolica painters of Urbino. Amongst Urbino motifs were figures, chimera, etc., also we find ornament in relief on salt boxes, inkstands, vases, coffrets, etc., of very decorative form. But the most remarkable production of Urbino was a series of vases designed by Battista Franco, 344 lovely specimens of which are in the Santa Casa de Lorette. The general belief in the claim of Vasari that the originator of the opaque tin-glaze in Italy was Luca della Robbia (1399–1482) has been shaken since the discovery of the Manfredi jug (mentioned above), and it is now supposed that Italian tin-glazed majolica was being produced by the 14th century at least.

Mexican Majolica.— Until about 10 years ago the fine specimens of old opaque tin-glazed majolica found in Mexico and sought for by collectors were supposed to be Spanish creations and imported by the colonists. Mrs. Robert W. deForest, with her fine collection of this ware (now donated to the New York Metropolitan Museum of Art), was led to take a generous interest in investigating the source of the product. And the late Dr. Atlee Barber of the Pennsylvania Museum, Philadelphia, by his researches disclosed the following facts: About 1526 the Spanish majolica technique was being taught to the colonists by Dominican friars from the Talavera potteries. In 1531 Pueblo de los Angeles started a pottery with Spanish artisans and became the centre of a large industry. Mexican-made enamel-glazed tiles were used, instead of the imported articles, to decorate the insides of the walls and also the exteriors of churches, hospitals, convents and even private houses. By 1653, as is shown by documents, the Mexican-made glazed pottery was equal to the imported and shipments from Spain were no longer in demand, and a potters' guild was established, to protect the industry in that year. By 1750 there were 30 prosperous potteries making three qualities of wares that they termed "fine, common and yellow." Five colors were used in fine ware, three in common ware. The best period was from 1650 to 1750. Specimens show two kinds of body — the white, soft, porous and the harder-baked red. The process used was that of baking the clay body first, then dipping in the tin enamel engobe and decorating over the enamel. The piece was then subjected to a second firing. The ware has been classified as follows: (1) "Hispano-Moresque" phase, up to the end of the 17th century. (2) "Spanish" or "Talavera" phase, from beginning of the 17th century to about end of the 18th century (showing Talavera influence). (3) "Chinese taste," done by copying pieces of imported Chinese porcelain, started 17th century and continued to end of 18th century. (4) "Hispano-Mexican" or "Puebla" phase, started about 1800 and lasted beyond 1850. Decadence followed, then extinction. The fourth style has green, yellow, purple, brown, red, black and later rose and mauve, in the decoration. Tiles have only three colors, blue, green and yellow, generally. The product consisted of chocolate or vanilla jars, vases, albarelli (drug pots), barrel-shaped flower jars, circular dishes, bowls, saltcellars, inkstands, basins, cup-holders, tiles, etc.

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CLEMENT W. COUMBE.

MAJOR, Charles (EDWIN CASKODEN), American novelist: b. Indianapolis, Ind., 25 July 1856; d. 1913. He was educated in the public schools and studied law, establishing a practice at Shelbyville. He contributed to various magazines and published 'When Knighthood was in Flower' (1898); 'The Bears of Blue River' (1901); 'Uncle Tom Andy Bill' (1908); 'Dorothy Vernon of Haddon Hall' (1902); 'Yolanda, Maid of Burgundy' (1905); 'Gentle Knight of Old Brandenburg' (1909); 'The Little King' (1910); 'Touchstone of Fortune' (1912).

MAJOR, (1) *in music,* a term applied to imperfect concords, but chiefly to the interval of the third. It also denotes that one of the two modern modes in which the third is four semitones above the tonic or key note. (2) *In military science,* the major is a field officer ranking next below a lieutenant-colonel and above a captain. He has generally the command of a battalion, the exercises of which he superintends, and in action or on parade carries into effects the orders of his superior officer. The term in the French service has been superseded by that of *chef dè bataillon.* A brigade major is an officer who performs for a brigade, or in garrison, the duties ordinarily discharged by a major in a regiment or battalion. A major-general ranks next above a lieutenant-general. In other cases, the term major, when applied as an epithet to the several denominations of men in an army, signifies the superior of the department; as sergeant-major, the chief non-commissioned officer in a regiment, who assists the adjutant; drum major, the chief of the drum corps, etc.

MAJORCA, mą-jôr'ką (Spanish *Mallorca;* Latin, *Balearis Major*), Spain, an island in the Mediterranean, the largest of the Balearic group; area, 1,330 square miles. It is about 120 miles distant from Spain. It is very irregular in shape, and deeply indented, particularly in the northeast. The scenery is picturesque, the climate mild and agreeable, and in many of the valley regions vegetation is luxuriant. There are quarries of marble of various grades; lead and iron have been obtained, and coal to a considerable amount is mined. The olive and vine are extensively cultivated and there are large orchards of figs and oranges. The principal exports are bricks, lime, plaster, olive oil, light wines, brandy, wool and silk. There is a wireless station with a 500-mile range located at Soller, not only for ship and shore traffic, but also for international service. The capital is Palma. Pop. of island, 264,231.

MAJORITY. See ELECTIONS; PRIMARY, DIRECT; PRIMARY, PRESIDENTIAL PREFERENCE; VOTE, VOTERS, VOTING.

MAJUBA (mä-joo'bä) **HILL,** an eminence in the extreme north of Natal, about 7,000 feet above the sea, the scene of the defeat of 648 British troops, with the loss of their leader, Sir George Colley, by a superior force of Transvaal Boers, 27 Feb. 1881. The attack was unexpected, and the Boers found the British resting after a night march and a climb of eight hours. The loss of the Boers was about 130, of the British more than 200 in killed and prisoners, besides many wounded and some missing. To the British nation the name Majuba Hill became a synonym for disaster. The anniversary of this fight was marked by the success of Lord Roberts, commander of the British forces in the campaign of 1900, when he received the surrender of the Boer commander, General Cronje.

MAKAROV, Stepan Osipovich, Russian vice-admiral: b. 1848; d. 13 April 1904. He entered the navy in 1864 and received rapid promotion for distinguished services. During the Russo-Turkish War 1877–78, he commanded the gunboat *Grand Duke Constantine,* and for a series of daringly successful attacks upon Turkish ports, which earned him the title of "the Cossack of the Sea," he was promoted captain of the second rank, aide-de-camp to the late Tsar Alexander II, was decorated with the orders of Saint Vladimir and Saint George and received a golden sword of honor. In 1881 he took part with the legion of Skobeleff in the capture of Geok Tepe in which General Kuropatkin also figured prominently. The same year he commanded the cruiser *Taman,* the station guardship of the Russian embassy at Constantinople, and made a careful and complete study of the defenses of the Bosporus. In 1882–83 he was chief of staff of the offensive squadron in the Baltic under Admiral Chihachev, Minister of the Navy. From 1891 to 1894 he was engaged in improvements of ordnance; among his inventions were the so-called cap guns possessing 20 per cent greater power of penetration into the newest superimposed armor; and the Ermak ice-breaker, the first of the ice-breaking vessels now used in Baltic and northern Asiatic waters. After the disastrous attack of the Japanese on the Russian fleet at Port Arthur in February 1904 Vice-Admiral Makarov was sent to the Far East to direct the Russian naval operations, and arrived at Dalny 8 March. He repaired and converted the blockaded squadron into an active aggressive naval force, but on 13 April was lured out of harbor by a decoy squadron. Discovering the Japanese main fleet trying to intercept him he at once returned and was about to enter the harbor, when his flagship, the *Petropavlovsk,* was destroyed by one of the sunken mines laid by the Japanese across the passageway, and Vice-Admiral Makarov, his guest, Vasili Verestchagin (q.v.), the famous war-artist, 16 staff officers and over 800 sailors perished.

MAKART, mäk'ärt, **Hans,** Austrian painter: b. Salzburg, 28 May 1840; d. Vienna, 3 Oct. 1884. He began his art studies in the Academy of Vienna. In 1859 he went to Munich, and painted in the studio of Piloty, under whose teaching (1861–65) he developed remarkable tal-

ent as a colorist. His earliest success was a Rembrandtesque picture of 'Lavoisier in Jail' (1862). His first work to gain him wide fame was his three-paneled picture, 'The Seven Deadly Sins' or 'The Plague in Florence,' which aroused a storm of adverse criticism, wonder and admiration in Paris and Germany. In 1869 the Emperor Francis Joseph built him a fine studio in Vienna, and he produced his series of 'Abundantia' pictures, 'Fruits of the Earth'; 'Fruits of the Sea.' In 1873 followed the picture which attracted so much attention in the Exhibition of Philadelphia (1876), his 'Venice Doing Homage to Caterina Cornaro,' now in the National Gallery at Berlin. He traveled in the East during the winter (1875–76), and his Egyptian sketches materialized in his 'Cleopatra,' 'Antique Hunt on the Nile,' etc. His 'Entry of Charles V into Antwerp' (1875–78) gained a medal at the Paris Exposition of 1878 and his 'Diana's Hunting Party' is one of the most successful of his larger paintings, combining superb coloring and modeling of the nude with grand landscape effect. It is in the Metropolitan Museum of New York and is most characteristic of the gorgeous sensuousness of a painter who woke the intellectualists of German art to a sense of color, and broke free from the traditions of a somewhat stiff and pedantic method, gaining in life and intensity what he sacrificed of academic correctness. Consult Lützow, 'Hans Makart' (1886); Stiassny, 'Hans Makart und seine bleibende Bedeutung' (1886).

MAKAW, or MACKAH, MACCAW, MACKAW, MI-CAW ("CAPE PEOPLE"), Indian tribe of Cape Flattery, Puget Sound, Washington. They are the southernmost tribe of the Wakashan stock and the only one within the boundaries of the United States. They are of the Nootha branch. They claimed a considerable territory between Flattery Rocks and Hoko, but ceded to the government all these lands except that in the immediate vicinity of Cape Flattery in 1855. The Makaw reservation was defined in 1873, and an added reservation for the use of the tribe was established in 1893 and is known as the Ozette. On the two reservations there were in all 465 Indians in 1905, and their numbers are diminishing. In 1806 Lewis and Clark estimated the tribe to number 2,000. They are of peaceful habits, are skilful fishermen and expert at water craft.

MAKEMIE, Francis, pioneer of the Presbyterian Church in the United States: b. Rathmelton, County Donegal, Ireland, 1658; d. Accomac County, Va., 1708. He was a born missionary and zealot, and on being licensed by the presbytery of Laggan sailed for the British West Indies, and began work in Barbadoes. In 1684 he sought a wider field in Maryland and organized the first Presbyterian congregation at Snow Hill, capital of Worcester County, Md. After 10 years' labor as an itinerant preacher in most of the Southern States he returned to England and induced two other ministers to accompany him back. He was the first moderator of the presbytery of Philadelphia (1706), which he assisted in forming; and visited New York (1707), where he was imprisoned for preaching, though when brought to trial was acquitted of lawbreaking. Consult Briggs, 'American Presbyterianism' (1885); Sprague, W. B., 'Annals of the American Pulpit' (Vol. III, New York 1858).

MALABAR, măl-ą-băr', British India, in the presidency of Madras, in the southwest, bordering on the Arabian Sea. It occupies an area of 5,795 square miles. A great portion is low land along the coast, rising abruptly at the east where it is bounded by the Western Ghats. The western part is intersected by long, narrow ravines, and the whole is covered with vegetation, in many places large forests. About 38 per cent of the total area is under cultivation and 33 per cent is forest. The average annual rainfall is 116 inches. The climate, though damp, is fairly healthful. There are a number of tea and coffee plantations and a large amount of rice is raised. The principal towns are Cochin, Callicut, Tellicherri, Kananur and Mangalore. The name Malabar is often applied to the whole extent of coast country from Cape Comorin as far north as Bombay. Pop. including the Laccadives, 3,015,119, of which 68 per cent is Hindu, 30 per cent Mohammedan and 2 per cent Christian.

MALABAR NIGHTSHADE, a succulent edible vine. See BASELLA.

MALABÓN, Santa Cruz de, săn'tă crooth dā mă-lă-bōn', Philippines, a pueblo of the province of Rizal, Luzon, also known as Tambóbong. See TAMBÓBONG.

MALABUYOC, mă-lă-boo'yŏk, Philippines, a pueblo of the province of Cebú, situated at the mouth of the Malutuoc River on the strait of Tañon, 60 miles southwest of Cebú, the provincial capital. Pop. 13,120.

MALACCA, mą-lăk'ą. See STRAITS SETTLEMENTS.

MALACCA, Strait of, the channel between the Malay Peninsula and the island of Sumatra, extending from lat. 1° to about 6° N. Entire length, about 520 miles; breadth, varying from 25 miles to 250 miles.

MALACCA CANE, an erect, slender-stemmed palm (*Calamus scipionum*) which, when dressed, is of a brown color, sometimes mottled or clouded. It is used principally for walking-sticks, and is brought from Singapore and Malacca, but is chiefly produced in Sumatra.

MALACHI, măl'ą-kī, one of the 12 minor Hebrew prophets, after whom the last canonical book of the Old Testament is named. The date of the book is assigned to 460–450 B.C. Nothing definite is known of the author whose name in Hebrew signifies "My Messenger." Jerome supports a tradition given in the Hebrew targum of Jonathan which identifies Malachi as a pseudonym of Ezra (q.v.) "The Scribe." The general style, the character of the arguments and preachments against the evils of the times, of the book of Malachi (q.v.), are in favor of the tradition.

MALACHI, Book of. The book is perhaps actually anonymous. The author's name appears only in i, 1, which is very probably an editorial addition. The word Malachi means "My messenger," and may have been taken from iii, 1.

There is no serious question affecting the authorship of more than a few verses of the book. It has often been thought that ii, 11f expresses a spirit of narrow Judaism which is

inconsistent with i, 11. This is so upon one interpretation of the latter passage which makes it refer to the turning of the nations to Yahweh either in the present or the future. That, however, is probably not the correct interpretation. The verse in the context, particularly in relation to the following verse, seems to be clearly present and not future. At present it is not susceptible of the broader meaning given; that could not have been true at any probable time of writing. Hence the probable meaning is rather that worship is offered by Jews who are scattered widely among the nations; the reference is to the faithfulness of the Jews of the diaspora. Thus understood it is not inconsistent with ii, 11f.

Verses 4–6, chap. iv, are quite certainly a later addition. Verse 4 is a legal gloss, quite different from anything else in the book; verses 5–6 are a gloss upon verses 1–3, a restatement of much the same idea but from a different standpoint, one that is out of harmony with the book.

The mention of Edom, i, 2–4, gives a general indication concerning the date of the book. These verses indicate some recent crushing disaster to Edom, which is narrated in a spirit of hatred to Edom. This hatred began, the history shows, with the treacherous violence of Edom at the destruction of Jerusalem in 586. The disaster here referred to was doubtless one that came from the invasion of the Nabateans, and might have taken place at any time during a considerable period before 312 B.C. The general time between 586 and 312 is thus indicated. The temple had been rebuilt after the exile, i, 10; iii, 1, 10, and the enthusiasm of the time of its rebuilding had passed away. This indicates a time considerably after 516 B.C. The general condition of the people is that of the time of Ezra and Nehemiah, with the temple service in disorder and disrepute, i, 6–8, 12–13; ii, 1, 8, 17; iii, 7–10, 14, see Nehemiah x, 32–39; xiii, 10–13. Also, the divorce of Jewish wives and the marrying of foreign wives were found frequently, ii, 10–16, see Ezra, ix-x; Nehemiah x, 28–30; xiii, 23–31. There is in the book, however, no reference to the work of Ezra and Nehemiah. Hence the book is to be assigned to the period before their activity, and presumably not long before, perhaps about 460 B.C.

The message of Malachi was intended to be primarily one of encouragement to the discouraged people in Palestine. The principal comprehensive thought of the book is that Yahweh still loves Israel, in spite of appearances to the contrary. This is stated at the beginning of the book, in i, 2–5. The reason assigned for the adverse conditions from which the people were suffering was the failure of the people to do their duty toward Yahweh. This was particularly a failure in relation to the outward national service. The outlook of the prophet is, therefore, in a considerable measure, formal. Yet this formal side is accompanied by a real ethical interest, as appears in ii, 27. A high standard for priestly activity is set up in ii, 7. The assurance of further prosperity for the people if they amend their ways is in connection with the coming of the day of Yahweh.

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MALACHITE, a native basic copper carbonate and hydrate, having the composition $CuCO_3.Cu(OH)_2$, crystallizing in the monoclinic system, but commonly occurring in massive form, or as an incrustation. It is brittle and has a specific gravity of about 4, and a hardness of from 3.5 to 4. Malachite is commonly subtranslucent, with an adamantine lustre. It is beautifully green in color, often banded with other colors and it occurs in many parts of the world, usually in connection with other ores of copper. Specially fine pieces are found in the Ural district, and at the Nizhne Tagilsk copper mines a deposit is known which contains at least half a million pounds of pure malachite. In the United States, the best-known deposits are those of Arizona. Malachite has been much prized as a gem stone and it is extensively used for panels, clock cases, table tops and other ornamental work.

MALACHY, Saint, Irish bishop: b. Armagh about 1094; d. Clairvaux, France, 1148. He belonged to the noble family of O'Morgair, was educated by Iombar, an anchorite, and ordained priest in 1119. He afterward studied at Lismore, and returning to Armagh was chosen bishop of Down and Connor (1125). His subsequent election to Armagh having been disputed (1129) he eventually, after a satisfactory settlement of the disputed questions and in accordance with his own desire, returned to the less important diocese, where he labored to secure for the Church a stronger foothold. In 1139 he set out on a mission to Rome. On his way thither he visited at Clairvaux and there began a lifelong friendship with Saint Bernard. He was commissioned in 1148 to go to Rome a second time, but was stricken on the journey and the last moments of his life were spent with Saint Bernard, at whose monastery he had stopped. He was a zealous reformer and to him is given the distinction of having opened the first Cistercian monastery in Ireland. The document known as 'Prophecy of Saint Malachy,' containing a Latin motto for each of the popes, is now considered not to be his production. He was canonized in 1190. Consult O'Hanlon, 'Life of Saint Malachy' (1859); Migne, J. P., 'Patrologia Latina' (Vols. CLXXXII, CLXXXIII).

MALACOLOGY. See CONCHOLOGY.

MALACOPTERYGII, măl-ą-kŏp-tĕ-rĭj'i-i, or **MALACOPTERI,** a group of fishes, in former systems of classification, including those with jointed and spineless or "soft" fin-rays. Compare ACANTHOPTERYGII; and see ICHTHYOLOGY.

MALACOSTRACA, one of the two primary divisions of the *Crustacea* to which all of the larger and more highly organized forms belong. The number of pairs of appendages and of segments is definite, the former being always 19 and the latter 19, except in the order *Leptostraca* which have also two abdominal

segments limbless. The boundary between head and thorax is not always clearly defined but the two always comprise 13 segments, of which five almost always belong to the head; the abdomen has six limb-bearing segments and is terminated by the telson which is probably a seventh segment. The head bears a pair of eyes, usually stalked, two pairs of antennæ, a pair of crushing jaws or mandibles and two pairs of maxillæ, to which a pair of maxillipeds is sometimes added (*Arthrostraca*). Of the typically eight thoracic segments from one to three bear maxillipeds and the remainder walking feet. In most cases the thorax is more or less completely covered by a carapace. The mode of development is varied, sometimes, as in the crayfish, it is direct, sometimes with a nauplius, but usually through the larval form called zoæa (see LARVA), which possesses paired eyes as well as a median eye, a swimming tail and usually seven pairs of appendages. The subdivisions are:

Order *Leptostraca* (*Nebalia*).
Order *Arthrostraca* { *Amphipoda* (beach fleas). *Isopoda* (wood lice). *Cumacea* (*Diastylis*). *Stomatopoda* (*Squilla*).
Order *Thoracostraca* { *Schizopoda* (*Mysis*). *Decapoda* { *Macrura* (lobsters and shrimps). *Brachyura* (crabs).

See CRUSTACEA.

MALADE IMAGINAIRE, mä-läd ē-mäzhē-nār, **Le,** a comedy in five acts by Molière. It was produced in Paris (1673), was the last work of its author and the last in which, as Argan, he appeared on the stage. See MOLIÈRE.

MALAGA, mäl'ą-gą (Sp. mäl'ä-gä, ancient MALACA), Spain, capital of the province of Malaga, on a small arm of the Mediterranean, about 65 miles northeast of Gibraltar. It was a Phœnician and afterward a Carthaginian colony, was a flourishing city under the Romans and its long occupation by the Moors has left distinct marks in the older parts of the town; the Gibralfaro, or Moorish castle, on a hill overlooking the town, and considerable portions of the ancient fortifications, yet remain. Among the important buildings are the cathedral, a highly decorated structure in the composite style with a spire 300 feet high; the episcopal palace, custom-house and several hospitals and charitable institutions, etc. The manufactures consist chiefly of iron, the ore of which is obtained from rich mines in the vicinity; soap, cottons, linens, machinery, etc. Wonderful gardens lie outside the town, like the Haciendas de la Concepción and De San José, where marvelous effects are produced by carefully tended sub-tropical vegetation. Along the coast in the direction of Vélez Malaga are ancient Moorish watch-towers, used, after the fall of Granada, against the Moors themselves, who often descended upon the coast to plunder and destroy. The harbor is excellent and the trade is of importance, the principal exports being olive oil, lead in bars, wine and fruit, particularly raisins, oranges and almonds. There used to be a great export of raisins to the United States, the consumption of which, however, declined in favor of the California product. The climate, mild, dry and equable, makes Malaga one of the finest resorts for invalids in Europe. Pop. 136,365.

MALAGA WINE, a sweet Spanish wine produced in the province of Malaga. It is one of the "muscatel" wines, and is rich, luscious and full of body. See also WINES.

MALAGASY SUBREGION, a faunal division of the Ethiopian Region in Zoogeography which embraces Madagascar and some small neighboring islands. See MADAGASCAR; ZOOGEOGRAPHY.

MALAKOFF, mä'lą-köf. See SEBASTOPOL.

MALAMPAYA, mä-läm-pā'yä, a sound on the northwest coast of the province of Paragua, island of Palawan, Philippines; it is an arm of the China Sea, extending 24 miles northwest to southeast, and from three to six miles wide. It is entirely landlocked, Tuluran Island protecting it from the China Sea, and is entered by Blockade and Endeavor straits. Its depth varies from 36 to 54 feet, it is free from sunken dangers to navigation, is one of the finest harbors in the Philippine Archipelago and has been suggested as one of the best locations for a naval station between Balábac and Manila.

MALANAO, mä-lä-now', the name commonly given the Moros, especially Ilanos, who live on the shores of Lake Malanas, island of Mindanao. See PHILIPPINE ISLANDS.

MALAPROP, Mrs., a character in the 'Rivals' of Sheridan. Like Shakespeare's Dogberry she is made to employ words of the same length, accent and more or less similar vowel and consonantal value, interchangeably. Hence her well-known "Allegory on the Banks of the Nile"; "Derangement of Epitaphs"; "A Barbarous Vandyke," etc.

MALAPTERURUS. See ELECTRIC FISHES.

MÄLAR, mä'lär, Lake of, Sweden, a lake running inland from the Baltic about 81 miles, with an average breadth of 13 miles and an area of 450 square miles. It contains upward of 1,200 islands. Its east end is closed by Stockholm, where its waters are poured into the Baltic by various channels, the difference of level being about six feet. It is surrounded by the populous districts of Stockholm, Nykioping, Upsal and Westeras, and the shores are varied with bays and hills, woods, lawns and cliffs, and are adorned with many castles, country-seats and villas, including the royal palaces of Drottningholm and Gripesholm.

MALARIA, an infectious disease due to animal parasites and which is characterized by intermittent attacks of chills and fever, so-called intermittent fever, or a continued fever with remissions; or by a chronic malarial cachexia. Malaria is a disease which is very widely distributed. It is found throughout Europe, particularly in the more southerly regions, Italy and Spain, but is absent in the more northerly parts of the Continent, where the temperature prohibits the development of the mosquito, the chief carrier of the disease. In Asiatic countries, particularly in India, malaria is very frequent; and in Africa different types of malarial fever constitute a feature most obnoxious to colonization. In the United States, particularly in the Southern States, malaria prevails. Along the New England coast, where it at one time was very common, it has become much diminished in prevalence and in severity. The Pacific Coast region is free from the disease,

and the Northwest States are comparatively free. In the region of the Saint Lawrence River malaria is unknown.

In order to understand clearly the different forms of malarial fever, it is important to bear in mind that the different types are due to minute animal parasites which enter the blood, usually by the bite of one of a particular genus of mosquitoes (*Anopheles*). (See MOSQUITOES AND THE PROPAGATION OF DISEASE). The parasite develops after its introduction into the blood and, according to the individual type that is introduced, certain variations in the developmental history of the disease result. The parasites themselves, which are thought to be low forms of animal life, protozoa, develop, for the most part, in the red blood-corpuscles and have many allies in the red blood-corpuscles of other animals, as frogs, fish, birds, monkeys, cats, etc.

These organisms were first clearly demonstrated by Laveran, a French army surgeon, in 1880, and his early observations were enlarged and amended by Golgi, Marchiafava and Celli, Manson and Ross, and a host of others. At the present time at least three forms of the parasite *Hæmatozoa malariæ* are known, the parasite of tertian fever, the parasite of quartan fever and the parasite of æstivo-autumnal fever. These parasites have two cycles of development, one taking place in the body of man and the other in the body of the mosquito. Thus a patient with malarial fever infects a mosquito with a parasite which undergoes certain transformations within the body of the mosquito, and is then in turn introduced into the body of another patient, to cause typical attacks of fever according to the type of parasite introduced. Occasionally two different parasites are introduced into the patient's body and a mixture of the two forms of the disease results.

The commonest form of malarial fever (the so-called chills and fever, or ague) is due to the tertian and quartan parasites. In these, after an unknown period of incubation, probably from 36 hours to 15 days, the patient has a feeling as though he were going to be sick, sometimes with headache, sometimes a feeling of lassitude and a desire to yawn and to stretch. Occasionally the patient has nausea and vomiting. At the same time the temperature has begun to rise and a chill commences. He begins to shiver, the face becomes drawn, thin and cold, the body shakes, the teeth chatter and the skin may be cold and blue, although the internal temperature is known to be gradually rising. After from 10 to 15 minutes, or perhaps a longer time, the chill is followed by a hot stage. The coldness of the surface disappears and the face becomes congested and flushed, the skin is red, the pulse is full and the patient may have a throbbing headache, with mental excitement. Thirst is excessive. Then the period of sweating begins, the whole body being covered with perspiration; the temperature drops, the headache disappears and in an hour or two the paroxysm is over.

A number of variations from this typical form are known. In the tertian type of fever the chill and fever usually occur every other day. This is due to the fact that the cycle of development of the tertian parasite is about 48 hours and that the stage of full development of the parasite, or sporulation, which is more or less coincident with the attack, occurs at these times. Thus every third day the patient has an attack, hence the term «tertian.» In the mixed infections, when two sets of parasites develop on alternate days, the paroxysms of chills, fever and sweating may occur every day. In the quartan type of fever the cycle of development of the parasite is completed every fourth day. Mixed infections also occur in this form of the disease. In the northern United States these are the types of malaria which are more common, but below Mason and Dixon's line a much severer form of the disease is present. This is the æstivo-autumnal type, which gives rise to the so-called bilious remittent fevers and typho-malarial fevers of the South. In these the symptoms are extremely irregular. The paroxysms occur every 24 or 48 hours, and longer remissions are known. The length of the paroxysms is usually longer, lasting 20 hours, instead of 10 or 12 as in the tertian form; the onset of the disease is usually slow and gradual; and there may be no chill. Occasionally there is a continuous fever without much break, the temperature ranging from 102° to 103° F. Jaundice is not infrequent, and this, with the fever and a furred tongue and mental disturbance, often gives rise to the suspicion of typhoid fever. In the simpler types the patient may get well after 10 days or two weeks without any special medication. The more severe forms may be fatal unless prompt diagnosis and medication are instituted. The diagnosis of malaria should always include an examination of blood and the demonstration of the parasite. In the vast majority of untreated cases the parasite can be found. Occasionally, however, repeated examination fails to show it.

Treatment should be prophylactic as well as actual and attention should be paid to the avoidance of infection no less than to care of the disease itself. Rigid protection of houses by means of screens to keep out the *Anopheles* is one of the most important procedures. Furthermore, it is highly essential that the mosquitoes themselves should be protected from the infection by screening all patients suffering from malarial fever. In order to do this the patient's couch should be surrounded by mosquito-netting and all mosquitoes in the room of the malarial patient should be killed by means of pyrethrum-powder. Further measures for destroying malaria should be taken by draining off swamps and employing proper engineering methods in order to get rid of the mosquitoes themselves. The planting of swamps with leafy trees often dries them up and thus prevents the formation of breeding-places for mosquitoes. Finally the specific, quinine, should be used in all cases. It is a prompt and sure parasiticide and in its varied forms can be used by almost every patient, despite individual idiosyncrasies.

In the consideration of some of the chronic forms of the disease a number of perplexing conditions are met. Thus, following constant exposure to malaria and repeated attacks of the disease, symptoms of anæmia, of breathlessness, swelling of the feet and ankles, bleeding in different parts of the body and enlarged spleen may be found. This is a type of infection known as malarial cachexia. It is found in southern countries and should be distinguished

from the cachexia due to various forms of intestinal parasites. See MOSQUITO; MIASMA; MICROSCOPY, CLINICAL.

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MALARIAL CACHEXIA, or **ANÆMIA.** See HOOKWORM DISEASE.

MALARIAL FEVER. See MALARIA.

MALASPINA GLACIER, Alaska, glacier extending from Mount Saint Elias, at an elevation of 18,000 feet, to Yakutat Bay, a distance of 90 miles, while its front on the Pacific is between 60 and 70 miles wide. It was named in honor of the Spanish explorer, Alejandro Malaspina, who traversed the region in 1789–94 in search of the Northwest Passage. With its tributaries, the Seward, Agassiz, Tyndall and Guyot, the Malaspina covers some 1,500 square miles of ground, and has a depth of more than 1,000 feet. As it reaches the Pacific it breaks into dangerous icebergs which threaten navigation, but leaves a front of great ice palisades.

MALATESTA, a noble Italian family, leaders of the Guelphs in Romagna and rulers in Rimini in 1216–1528. Giovanni and Malatesta of the Malatesta tribe entered Rimini in 1216 and were granted citizenship in consideration of their aid against Cesena. The family rapidly gained in power and in 1237 Giovanni was named podestà. He was succeeded upon his death in 1247 by his son, Malatesta de Verrucchio, who became supreme ruler in 1295 and who steadily increased his power until his death in 1312 at the age of 100 years. He also increased the power of the Guelphs and enjoyed the favor of Pope Boniface VIII. Of his four sons, two were Giovanni and Paolo, husband and lover of Francesca da Rimini, whose story is told in Dante's 'Inferno.' Malatestino, the eldest son of Malatesta, succeeded him upon his death in 1312, maintained the power of the Guelphs, annexed Cesena and dying without issue in 1317 was succeeded by his youngest and only surviving brother, Pandolfo. The power of the Malatestas was extended over neighboring territories in succeeding years and the family became one of the most influential of the Renaissance. Carlo (b. 1394; d. 1429) was an ardent supporter of the popes, represented Gregory XII at the Council of Constance and was named vicar of the church in Romagna. His nephew, Sigismondo (b. 1417; d. 1468), was a valiant soldier, a patron of arts and letters as well as a poet and renowned antiquarian. He built the church of Saint Francis, or temple of Malatesta, one of the most beautiful structures of the Renaissance. He made war for and against Pope Eugenius IV; against Venice and Florence with the Aragonese, then against the Aragonese at Piombino. He afterward fought with and against the Sienese, supported the cause of the Angevins and was excommunicated and burned in effigy by Pope Pius II. He was afterward restored to the Church but before his death he was practically stripped of his powers and possessions. He was succeeded by his wife, Isotta, and his son, Salustio, but both were murdered by an illegitimate son, Roberto. Roberto's son, Pandolfo IV, was the last Malatesta to rule Rimini, and he sold his rights to the Venetians in 1503. Thereafter the Malatestas at various times endeavored to regain control of Rimini until 1528 when it was incorporated in the papal states. The Malatestas became citizens of Venice and the Rimini branch became extinct in 1716. Consult Battaglini, 'Memorie Storiche di Rimini e de suoi signori' (Bologna 1789); Fossati, 'Le tempi di Malatesti de Rimini' (Foligno 1794); Hutton, 'Sigismondo Malatesta' (1906).

MALATIA, MALALIETH, or **AZPUZU,** Asiatic Turkey, chief town and military post in a sanjak of the same name in the vilayet of Mamuret el-Aziz, on the Samsun-Sivas-Diarbekr Road, 10 miles southwest of the junction of the Tokhma-Su with the Euphrates and 100 miles northeast of Marash. The town is modern, being practically rebuilt since the earthquake of 1893; and previous to that dating to the middle of the 19th century when the old Malatia was abandoned after its destruction in the military operations of Hafiz Pasha, the new town being built on the site of the former summer colony Azpuzu. The old town of Malatia (ancient Melitene) lies five miles to the northeast of the present town and is now known as Eskishehr. It has many inhabitants, extensive gardens and interesting ruins. It was the station of the 12th, or "Thundering Legion," under Titus and was raised to a city under Trajan. It was capital of Armenia Tertia under Justinian. It changed hands between the Greeks and Saracens several times, was reputed to possess 60,000 fighting men at the opening of the 11th century and in 1102 was returned to Saracen control. The modern Malatia is an important trading centre and the district is famous for its orchards and vineyards. A fine grade of opium is also produced. There are Roman Catholic and Protestant missions. The population includes many Christian Armenians besides the Turks and Kurds. There was a massacre of Christians in 1895. Pop. (estimated) 30,000.

MALAUEC, mą-low'ek, a provincial language, used largely in commerce in Luzon, Philippine Islands (q.v.).

MALAY (mā-lā) **ARCHIPELAGO.** See EAST INDIES or MALAY ARCHIPELAGO.

MALAY PENINSULA (Malay, Tanah Malayu, or Malay Land), a long strip of land extending from Indo-China south and southeast toward the island of Sumatra, the most southerly part of the Asiatic continent. The peninsula begins properly at the head of the Gulf of Siam, and would thus include part of Siam proper and the British province of Tenasserim; but it is usual to limit the name to the portion south of the river Pakshan, the frontier of Tenasserim. In the larger sense, the length of the peninsula is about 870 miles long and its area 83,000 square miles; the population is estimated at about 2,000,000. The width varies

from 45 miles to 210. The interior consists mainly of magnificent wooded granite mountain ranges, some of whose peaks attain a height of 7,000 feet; while along the coast there is almost everywhere a flat and fertile belt, fringed with numerous islands. There are numerous small rivers. The mean annual temperature near the sea is about 80°. There is no winter, but rains are frequent through the year. The humidity of the climate renders it very trying to foreigners. Tigers and leopards are numerous and of great size. The Indian elephant, the rhinoceros and several species of monkeys are found; also the vampire bat, poisonous snakes and many beautiful and brilliant birds. Tin abounds and is largely worked. Silver and gold are also found in paying quantities. There are over 40 varieties of palm in the peninsula and the vegetation is that of the luxuriant tropical kind. In physical features the peninsula resembles rather the islands of Sumatra and Java than Indo-China. The inhabitants are mainly Siamese in the north, civilized Malays (q.v.) along the coast and uncivilized Malays, mixed with aboriginal Negrito tribes, in the interior. Politically, the northern part of the peninsula is occupied by small states tributary to Siam (as far south as 5° N.); the southern part by Malay states under British protection (as Perak, Salangor, Negri Sembilan, and Pahang, known as the Federated Malay States) and the British Crown colony of the Straits Settlements, comprising Singapore, Malacca and Penang. (For the commerce, industries, education, transportation facilities of the peninsula see articles on the individual states or groups of states, as FEDERATED MALAY STATES; BURMA; PERAK; PAHANG; SINGAPORE; STRAITS SETTLEMENT). Consult Bishop, 'The Golden Chersonese' (London 1883); Clifford, Hugh, 'Studies in Brown Humanity' (ib. 1898); id., 'In a Corner of Asia' (ib. 1899); Lucas, 'Historical Geography of the British Colonies' (Oxford 1894); Rathbone, 'Camping and Tramping in Malay' (ib. 1898); Skeat, W. W., 'Malay Magic: An Introduction to the Folklore and Popular Religion of the Malay Peninsula' (ib. 1900); Skeat and Blagden, 'Pagan Races of the Malay Peninsula' (New York 1906): Oldham, W. F., 'India, Malaysia and the Philippines' (ib. 1914); Wright and Reid, 'Malay Peninsula' (ib. 1912).

MALAY STATES. See FEDERATED MALAY STATES.

MALAYALAM, an independent Dravidian dialect of southern India, originally allied to Tamil and spoken on the Malabar Coast by between six and seven million inhabitants called Malayalim or Malabars who form a separate race with distinctive castes, customs, traditions and literature. Malayalam is said to have developed from Tamil since the 9th century and now differs from it in pronunciation and in idiom, and in the retention of old Tamil forms obsolete in the modern languages. Sanskrit words are more numerous in Malayalam, while in Tamil, they are less than in any other Dravidian tongue. Malayalam appears about A.D. 1150 in inscriptions of the rulers of Kerala from Travancore and has an extensive literature, of which the 13th century epic 'Ramacharitam,' the oldest poem in the language, and a collection of 1,000 Malayalam proverbs published in Mangalore in 1868 are notable examples. See DRAVIDIAN. Consult Ellis, F. W., 'Dissertation on the Malayalam Language'; Gundert, 'Malayalam Dictionary' (1872); Frohmeyer, 'Progressive Grammar of the Malayalam Language for Europeans' (Mangalore 1889); Menon, T. K. K., 'Notes on Malayalam Literature' in *Royal Asiatic Journal* (London 1900).

MALAYAN BEAR, or SUN BEAR, a small bear (*Ursus malayanus*), found in the Malayan Archipelago, Borneo, Sumatra and Java. It is about four and a half feet in length; the fur is black, fading into brown on the nose which is remarkably broad and blunt. The chest bears a crescentic white mark, or an orange-colored, heart-shaped patch.

MALAYAN SUBREGION, a faunal division of the Oriental Region, composed of the southern end of the Malay Peninsula and all the islands of the Malay Archipelago as far as the Philippines and to the Straits of Macassar, where this district is separated from the Australian and Papuan subregions by Wallace's line (q.v.). The fauna of this subregion is composed of animals adapted to a uniform but not extreme heat, coupled with abundant moisture. The orang-outang and the birds of paradise are its most characteristic groups. See DISTRIBUTION OF LIVING MAMMALS; ZOOGEOGRAPHY.

MALAYS, a race of people inhabiting the Malay Peninsula and the Malay Archipelago, and claiming to have their native country in the highlands of Sumatra. The civilization of India appears to have extended itself to the Malays at an early date. In the 13th century the Malays were on the peninsula of Malacca, where they built a city of the same name, and founded an empire. The sultans had subdued Sumatra previously to their settling in Malacca. They afterward possessed themselves of the rest of the Sunda Isles, of the Philippines, the Moluccas and some of the Australian groups, where Malay tribes are found resembling, in their features, religion and government, the Malays of Malacca. At that time they acted a splendid part in Asia; they carried on commerce, in part with their own ships, and planted colonies. Great numbers of ships from China, Cochin China, Hindustan and Siam filled the harbors of Malacca. They are now divided into distinct tribes, without any general head. This is partly owing to the superiority which the Europeans, particularly the Dutch, have obtained in the Indian seas, and partly to the feudal system of the Malays, by which the national power has been divided and a common spirit prevented by the increasing power of the vassals. The civilized Malays profess the Mohammedan religion. Besides the Koran, the Malays have various local laws. They are fierce and warlike, always bearing arms, and much addicted to the use of force, treacherous in their alliances and were formerly addicted to piracy. The Malay language is widely used as the language of commerce throughout the South Seas and in the islands south of the Philippines. Physically considered the Malays are of low stature, slight in figure and with very small wrists and ankles. The face is round, the eyes black and somewhat almond-shaped, the nose short and small, cheek bones prominent, features flat, the hair straight

and black, the complexion yellowish. In various respects they bear a close resemblance to the Mongolians of eastern Asia, but differ from them radically in language, all their dialects belonging to a distinct Malayo-Polynesian family which is widely distributed throughout the Indian and Pacific oceans. The Malays long pursued a piratical career, darting from hidden streams in their well-manned proas on any vessel that approached too near the coast, or more boldly lying in wait in fleets in the open sea, for any expected rich prize. Of late years the lessons taught them by European and American war vessels have forced the Malays to desist from piracy, their old lawless, roving habits being largely abandoned for their more settled occupations of trade and agriculture. Among the many Malay tribes are the Sakais, or tree-dwellers, who build their houses in forked trees, 8 to 12 feet above the ground, reached by bamboo ladders which are hoistd at will. The tree-dwellers formerly made use of long blow-guns shooting poisoned arrows. The bamboo furnishes most of their articles of ornament and utility. The blow-gun was a bamboo about an inch and a half in diameter and six and a half feet in length. The bore, drilled most accurately, was a quarter of an inch, and the darts nine inches in length, about the circumference of a heavy darning-needle, sharpened at one end and poisoned. With these they secured all the meat they eat in the jungle — birds, monkeys, snakes and lizards. They also have knives made of bamboo.

The Malay intellect varies from that of savagery in the uncivilized tribes of the interior to a rather high degree of culture among the coast tribes. Much of their civilization is due to foreign influences, chiefly Hindu and Arab. The Malay language, which is soft and harmonious and of simple structure, is written in the Arabic character, which is ill suited for the purpose. Lately the Roman system has been largely adopted, especially in the Dutch and English dependencies. The literature, which is copious, comprises poetical compositions, such as rhyming-proverbs, love-songs and dramas displaying some originality, but little imagination. The prose writings are mostly based on Arab or Persian models.

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MALBAIE, Canada. See MURRAY BAY.

MALBONE, măl-bōn', **Edward Greene,** American painter: b. Newport, R. I., August 1777; d. Savannah, Ga., 7 May 1807. As a boy he was in the habit of frequenting the theatre at Newport to watch the painting of the scenes. At that early age he executed an entire scene, a landscape for the stage, the success of which encouraged him to devote his attention exclusively to painting. At 17 he established himself in Providence as a portrait painter. Meeting with success, he removed in 1796 to Boston, and during the next four years pursued his art in various cities. In 1800 he accompanied Washington Allston (q.v.) to Charleston, and in the succeeding year the two young artists sailed for Europe. Malbone when in London was urged by Benjamin West to take up his permanent residence there with the prospect of ample professional employment; but he returned to Charleston in December 1801. For several years he painted miniatures in the chief cities of the United States with great reputation. His principal imaginative work is 'The Hours,' in which the divisions of the day are personified by female figures.

MALBROUK, măl-brūk', a yellowish, grizzled monkey of West Africa (*Cercopithecus cynosurus*), distinguished from other species of the genus (called guenons) by its wide flesh-colored face with a band across the forehead, the bristly whiskers and ventral part white.

MALCOLM, măl'kŏm or mâ'kŏm, the name of four Scottish kings: MALCOLM I reigned from 943 to 954, and during this period occurred the cession of Cumbria to the Scots by Edmund I, the English sovereign. MALCOLM II (d. Glams 1034), succeeded Kenneth II in 1005 and in his reign Lothian and Strathclyde were secured to Scotland. MALCOLM III, surnamed Canmore (Great Head); b. about 1024; d. near Alnwick, Northumberland, 13 Nov. 1093. After the murder of his father, Duncan, by Macbeth, he was assisted by Siward of Northumbria, and Edward, the Confessor. After the death of Macbeth he was crowned at Scone in 1057. In 1067 he granted asylum to Edgar Atheling, his mother, and two sisters (one of whom, Margaret, he married in 1068), with a number of Saxon exiles. His reign, though largely concerned in warring with England, had nevertheless an important bearing on the civilization and consolidation of Scotland. MALCOLM IV (the Maiden), d. Jedburgh, 9 Dec. 1165, succeeded his grandfather, David I, in 1153. He suppressed two rebellions in his realm and surrendered Northumberland and Cumberland to Henry II in 1157.

MALCOLM, SIR **John,** British administrator and diplomatist: b. Burnfoot, Dumfriesshire, 2 May 1769; d. London, 30 May 1833.

He entered in 1782 the service of the East India Company, in 1797 was made captain, and till 1799 was engaged in various important services, terminating at the fall of Seringapatam. He was three times Ambassador to Persia, and in 1822 was made major-general. He was governor of Bombay, 1826–30, when he finally returned to Britain. His principal works are 'A Sketch of the Sikhs'; 'The History of Persia' (1815); 'Sketches of Persia'; 'Life of Lord Clive' (1836). Consult Kaye, 'Life and Correspondence of Sir John Malcolm' (1856–57).

MALCZEWSKI, mäl-chĕv'skē, **Antoni,** Polish poet: b. Warsaw, Poland, 3 June 1792; d. there, 2 May 1826. He entered the Polish army in 1811 but resigned in 1816 and traveled on the Continent, where he met Byron. He settled in Warsaw and there wrote 'Marja' (1825), an epic poem which after his death was recognized as a literary work of great merit, and has since been translated into several languages. None of his work brought him fame or recognition during his life, and he died in wretched poverty. A tomb "To the author of Marja" was erected in Varsovia.

MALDEN, mâl'dĕn, Mass., city, in Middlesex County, on the Malden River, and on the Boston and Maine Railroad, about four miles north of Boston. It is connected by electrical railway with Boston, Lowell, Haverhill, Lynn, Salem and a number of other cities and towns. Malden includes several villages. The first settlement was made in 1641, but the place remained a part of Charlestown until 1649, when it was made a separate, incorporated municipality. It was chartered as a city in 1881. It is a manufacturing city, having over 630 manufacturing establishments, representing nearly 50 different industries. The chief products are rubber boots and shoes, boot and shoe lasts and boot-trees, wire cord, leather, cotton goods, fibre goods, hosiery and hosiery supporters, knit goods, furniture, soap and picture molding. The manufactories have a combined capital of nearly $8,000,000, and the annual output is nearly $21,000,000. The number of employees is about 6,200. The municipal expenditures are annually about $604,520; the principal items of which are for schools, $282,300; for waterworks, $55,000; charities, $60,000; for fire department, $69,000; police, $68,000; for municipal lighting, $34,000. Metropolitan District water system supplies water to the city, also to Melrose and Medford. Malden has excellent public and parish schools, a number of fine church buildings, a Y. M. C. A. building, four libraries which contain about 65,000 volumes, Malden Public Library, a Home for the Aged and a city home — private hospital. The Converse Library building, designed by Richardson, is beautiful and commodious. The government is vested in a mayor and a council. The executive appoints, subject to the approval of the council, the administrative officials. Pop. 48,850.

MALDIVE (mal'dīv) **ISLANDS** (Thousand Isles), Indian Ocean, a chain of islands at the entrance to the Arabian Sea, 500 miles west of Ceylon, extending from lat. 0° 40′ S. to 7° 6′ N., nearly on the meridian of 73° 30′ E., with a breadth of about 50 miles. The chain is composed of 17 coral atolls (see ATOLL), the larger islands richly clothed with wood, chiefly palm, fertile in fruit and in various kinds of edible roots. They also produce millet and abound in cocoanuts, fowls and all descriptions of fish. The inhabitants are a civilized race of people of mixed Singhalese and Arab extraction, Mohammedans and speaking a dialect closely allied to the Ceylonese. They carry on a considerable trade with Bengal, Ceylon and the Malabar coast, as also to the Red Sea and to Sumatra; exchanging cowries, which are plentiful in the Moldives, coir, mats, oil, fish, tortoiseshell, etc., for rice, sugar, tobacco and manufactured goods. They are expert navigators and sailors, and have schools for teaching navigation on some of the islands; and they make and repair nautical instruments. They are governed by a sultan, whose title and rank are hereditary; he resides in the island of Mali and pays annual tribute to the British government in Ceylon. Pop. about 50,000. Consult Gardiner, J. S., 'Fauna and Geography of Maldive and Laccadive Archipelagos' (10 vols., Cambridge 1901–06).

MALE FERN. See FERNS AND FERN-ALLIES.

MALE PREPONDERANCE. See PREPOTENCY.

MALEBRANCHE, mal'brăñch', **Nicholas** French philosopher: b. Paris, 6 Aug. 1638; d. there, 13 Oct. 1715. He studied philosophy in the Collège de la Marche, theology in the Sorbonne and entered the congregation of the Oratorians in 1660. In the history of French metaphysical speculation he ranks second only to Descartes, the greatest of French thinkers, and in 1699 was made member of the Academy of Sciences. He was induced to give many years' study to the Cartesian philosophy by the perusal in 1664 of the treatise 'De Homine' by Descartes, and the fruit of his investigations appeared in his brilliant and original works, 'De la Recherche de la Vérité' (1674), and 'Traité de l'Imagination.' The essence of his philosophy is a sort of mystical idealism. According to him we have cognizance of things, as well objective realities, as subjective thoughts and feelings, through the idea which resides in our souls; but this idea is in God, so that we perceive everything in God (*vision en Dieu*) as the primal cause of all existences and things. Hence the famous doctrine of "Occasionalism" or "Interference," in accordance with which the objective thing and the subjective impression are made on every occasion to coincide, by the direct interposition of God, in whom alone we think and feel. In the history of philosophy Malebranche may be styled the connecting link between Descartes and Spinoza, the difference between his philosophy and that of the pantheist. Spinoza consisting in the fact that to him the Universe was in God, and to Spinoza God was, in fact, in the Universe. Among his other works are to be mentioned 'Conversations chrétiennes' (1677); 'Traité de la nature et de la grâce' (1680); 'Traité de la morale' (1684); 'Entretiens sur la métaphysique et sur la religion' (1688); 'Entretiens d'un philosophe chrétien et d'un philosophe chinois sur l'existence et la nature de Dieu' (1708). Consult Blampignon, 'Etude sur Malebranche' (1861); Ollé-Laprune, 'La philosophie de Malebranche' (1870); André, 'La vie du Révérend Père

Malebranche' (1886); Farny, 'Etude sur la morale de Malebranche' (1886).

MALESHERBES, Chrétien Guillaume de Lamoignon de, krā-tĕ-ăñ gē-yōm dė lä-moin-ōñ dė māl-ĕs-ārb, French statesman: b. Paris, 6 Dec. 1721; d. there, 22 April 1794. He was educated at the Jesuits' College, entered the legal profession and in 1745 became counsellor of the parlement of France; in 1750 he was president of the Court of Aids. He was broad-minded and liberal in his policy, favoring the publication of the 'Encyclopédie' and owing to his protestation against different measures of Louis XV was removed from office. Under Louis XVI he was Minister of the Interior, but resigned in 1776 and until the Revolution spent his time upon his estates and in travel, with the exception of 1787–88, when he was again Minister. At the outbreak of the Revolution he came loyally to the assistance of Louis XVI and was leading counsel in his defense. He remained with the monarch until almost the last and 11 months later was guillotined for treason. He was the author of essays and pamphlets on financial questions, etc.

MALET, Claude François de, klōd frāñ-swā dė mā-lā, French conspirator: b. Dôle, Franche-Comté, France, 28 June 1754; d. Paris, 29 Oct. 1812. He entered the army in 1771 and became a brigadier-general in 1799. Suspected of conspiracy against Napoleon, he was dismissed from the army in 1807 and confined in La Force. While there he laid new plots and was thenceforward confined in a state prison from 1808 till 1812. During Napoleon's campaign in Russia Malet made his escape from prison on the night of 22–23 October, and by circulating the false news of Napoleon's death won over some of the National Guards. While the latter secured the principal public offices in his name, Malet liberated his fellow conspirators, Generals Guidal and Lahorie, from prison. He was, however, himself taken prisoner by Laborde, chief of the military police of Paris, and was shot with his fellow conspirators.

MALET, Lucas. See HARRISON, MARY SAINT LEGER.

MALFATH, Giovanni Francesco Guiseppe, Italian mathematician: b. Ala di Trento, 1731; d. Ferrara, 1807. He was educated at the Jesuit College at Verona and later studied under Riccatti at Bologna. For 30 years from 1771 he was professor of higher mathematics at Ferrara and attained high rank among the mathematicians of his time. He is best remembered for his publication of a mathematical problem known as "Malfath's problem," of which he gave the first solution. It was published in a memoir, 'Tentativo per la risoluzione delle equazioni di quinto grado' (Pavia 1772),

MALFORMATION IN PLANTS. See PLANTS, MALFORMATION IN.

MALHERBE, François de, frāñ-swā dė māl-ārb, French poet: b. Caen, France, 1555; d. Paris, 16 Oct. 1628. He was educated in Heidelberg and was engaged in the wars of the League. In 1605 he became court poet under Henry IV, but his work as a critic was of greater value than his poetry, which was lacking in poetic feeling and originality, though metrically perfect. He was the founder of the French school of classicism and must be credited with arousing a critical sense among the thinkers of France. His works consist of translations from the Latin and one volume of original verse. Consult Allais, 'Malherbe et la Poésie française à la fin du XVI. Siècle' (1892); Brunot, 'La Doctrine de Malherbe' (1891).

MALIBRAN, Maria Félicité, mezzo-soprano singer: b. Paris, 1808; d. Manchester, England, 1836. She was early trained for the operatic stage by her father, Manuel Garcia (q.v.), the Spanish tenor, and made her début in London (1825). She had lived in that city since 1817 as a teacher of singing, and her success in Rossini's 'Barber of Seville' was such that she was induced to follow her father to New York, where he had an engagement to establish grand opera. Here she married a French merchant named Malibran. She returned to the stage on her husband's failure in business, and in the spring of 1828 appeared on the Parisian boards in Rossini's 'Semiramis.' She subsequently was welcomed with great enthusiasm in London, Naples, Vienna, Milan and Venice, and traveled with the violinist de Bériot, whom she married shortly before her early death. She was a great actress as well as a marvelous songstress, and the irresistible charm of her person, added to the generosity of her mind and disposition, made her during her brief career one of the most fascinating operatic singers that had ever won the applause of the European public. In 1838 a statue was erected to her in Brussels, which had been her last place of residence. Consult Nathan, 'Life of Madame Maria Malibran de Bériot' (1846); Teneo, M., 'La Malibran, d'après des documents inédits' (in 'Sammelbände der internationalen Musik-Gesellschaft,' Leipzig 1906).

MALIC ACID, an organic acid discovered in 1785 by Scheele, and now known to be widely diffused throughout the vegetable kingdom, occurring sometimes in the free state, and sometimes in the form of its potassium, magnesium or calcium salts. It occurs abundantly, for example, in the gooseberry, cherry, strawberry and barberry, and also in unripe apples, from which latter fact it derives its name (Latin *malum,* an apple). It may be conveniently prepared by boiling the juice of mountain ashberries with enough milk of lime to almost neutralize it, and pouring the precipitate into boiling dilute nitric acid. Acid malate of calcium crystallizes from the nitric acid upon cooling, and this is dissolved in water, and precipitated by acetate of lead, the lead malate that is thrown down being subsequently decomposed by sulphuretted hydrogen gas. Malic acid has the formula $C_4H_6O_5$ or $C_2H_3(OH)(COOH)_2$, is dibasic, and can be obtained in the form of colorless prisms or needles, which are hygroscopic, and dissolve readily in water and in alcohol. Malic acid kills algæ, and when present in a solution in any considerable amount it prevents the precipitation of cupric and ferric salts by the alkalis. With bases it forms compounds known as "malates," which are mostly soluble. See SUCCINIC ACID.

MALICE, *in law,* a premeditated or formed design to do mischief or injury to another, called also "malice prepense" or "aforethought." Blackstone says that malice prepense is not so properly spite or malevolence to the deceased

in particular, as any evil design in general; the dictate of a wicked, depraved and malignant heart; and it may be either express or implied in law. Express malice is when one, with a sedate, deliberate mind and formed design, doth kill another. In many cases where no malice is expressed, the law will imply it; as where a man wilfully poisons another; in such a deliberate act the law presumes malice, though no particular enmity can be proved. A spiteful, malignant, vindictive or revengeful disposition is apt to commit acts of malice both in the ordinary and the legal sense, and mav be guilty in the former and not in the latter sense. An injurious act emanating from a weak mind, a lack of caution or a sudden, unaccountable impulse, may have all the force of ordinary malice, but in the absence of a designed, intentional injury, it will not come within the strict limits of criminal malice. The law infers an intent to kill from the deliberate use of a deadly weapon, and it has been held that a burglar intended murder when he broke into a dwelling because he would commit it if necessary to escape.

MALICIOUS MISCHIEF, *in law,* any injury done to the person or property of another with deliberate malice. This is an indictable offense both in Great Britain and the United States. The comprehensive English Black Act (so-called from its preamble that "several ill-designing and disorderly persons have of late associated themselves under the name of blacks") with others of a like kind were in 1861 codified (24 and 25 Vict., ch. 97) into an act which extends malicious mischief to buildings, fish ponds and other real estate, as well as to most classes of personal property. To constitute this offense, real not merely legal malice must be proved, such as is defined by Blackstone, "a spirit of wanton cruelty or black and diabolical revenge"; or, as defined by the Supreme Court of Massachusetts, "a spirit of cruelty, hostility or revenge." This spirit must be cherished by the offender not against a third party, but against the party whose person or property has been injured. Some States of the Union make secrecy a necessary element in the offense, others generalize the offense as implying merely the infliction of unlawful injury. If the injury was inflicted in the discharge of official duty, or under an honest sense of justification, this is sufficient defense to secure acquittal. The offense may be either a misdemeanor (q.v.) or a felony (q.v.) according to its circumstances. Consult Bishop, 'Commentaries on the Law of Statutory Crimes' (3d ed., Chicago 1901); McClain, 'Treatise on Criminal Law, as Now Administered in the United States' (Chicago 1897); and Harris, 'Principles of the Criminal Law' (London 1899).

MALICIOUS PROSECUTION, prosecution of a person unsuccessfully, maliciously and without cause. To constitute this offense it must be proved (1) That the prosecution averred to be malicious was instituted by the defendant named. (2) That it was decided against prosecutor. (3) That the suit was without probable cause. (4) That the motive was malice. (5) That the plaintiff was injured by such malicious prosecution.

Quod facit per alium facit per se is fully applicable to the defendant in a suit for malicious prosecution; hence a corporation may be liable though they acted through their agent. (See Tort). Consult Newell, M. L., 'Malicious Prosecution, False Imprisonment and Abuse of Process' (Chicago 1892).

MALIGI, mä-lē-hē', Philippines, an island lying southeast of Talim Island in the Bay Lagoon (q.v.); it is the seat of the United States military prisons.

MALIGNANT POSTULE. See Anthrax.

MALIGNANTS, in English history, a name applied in 1643 by members of Parliament to designate those whom they considered to be the evil advisers of Charles I. Afterward the name was extended to all who sided with the king against the Parliament.

MALINAO, mä-lē'now, Philippines, (1) a pueblo of the province of Albay, Luzon, situated on the Lagonoy Gulf, 18 miles north by west of Albay, the provincial capital, and three miles north of Tabaco. It is on the main road and is the shipping point for the large hemp product of the surrounding region. There is an extinct volcano nearby and also mineral springs. Pop. 12,437.

MALINES, mä-lēn. See Mechlin.

MALINGERING, mä-lĭng'gẽr-ĭng, a term denoting feigning disease on the part of a soldier, sailor, prisoner, etc., in order to obtain discharge from service, or escape from duty or labor. It implies some overt act, such as the previous application of a ligature, or the taking of some drug, which produced the appearance of the disease said to exist. A worse form of the same crime, "wilfully maiming," is erroneously called malingering. Consult Callie, J. 'Malingering and Feigned Sickness' (New York 1913); and Smith, W. R., 'Medical Jurisprudence' (London 1913).

MALL, Franklin Paine, American anatomist: b. Belle Plaine, Iowa, 1862. He took his M.D. at the University of Michigan in 1883, later studied at Heidelberg and Leipzig and in 1886–88 was a Fellow at Johns Hopkins, acting as instructor in pathology at that institution 1888–89. He was adiunct professor of vertebrate anatomy at Clark University in 1889–92, and was professor of anatomy at the University of Chicago in 1892–93. He has been professor of anatomy at Johns Hopkins University since 1893 and since 1915 has also served as director of the department of embryology at Carnegie Institute, Washington, D. C. He is a trustee of the Marine Biological Laboratory, Woods' Hole, Mass., and has written extensively for scientific publications.

MALL, mâl or mĕl, **The,** (1) a promenade in Central Park, New York, regarded as one of the most successful landscape effects in the United States. (2) An avenue in London, on the north of Saint James Park.

MALLALIEU, măl-la-lū', **Willard Francis,** American Methodist bishop: b. Sutton, Mass., 11 Dec. 1828; d. 1911. He was graduated from Wesleyan University in 1857 and became a Methodist Episcopal clergyman in 1858. He held many important charges and in 1872, 1876, 1880 and 1884 was a member of the general conferences. He was presiding elder of the district of Boston in 1882–84 and in 1884 was

elected bishop. He retired in 1904. He published 'The Why, the When, and How of Revivals' (1901); 'The Fullness of the Blessing of the Gospel of Christ' (1903); 'Words of Cheer and Comfort' (1907).

MALLARD. See DUCK.

MALLARMÉ, Stéphane, stā-făn māl-ăr-mā, French poet: b. Paris, 18 March 1842; d. Valvins, Fontainebleau, 9 Sept. 1898. Most of his life was passed as an instructor in English at the Lycée Fontanes of Paris. He is known as the founder of the curious poetic school of the "Décadents," in whose organ, *Le Décadent*, as well as in *Le Parnasse Contemporain*, he published much. Incomprehensibility appears to have been the object of his study, and he entirely attained it in his preface to an edition (1880) of Beckford's 'Vathek.' Others of his works are 'L'Après-midi d'un faune' (1876); 'Petite Mythologie' (1878); 'Les Dieux antiques' (1880); 'Poésies' (1887), a translation of Poe's poems (1888), perhaps his most satisfactory performance; and 'Vers et prose' (1893).

MALLEABILITY, *in metallurgy,* the property of extending under the blow of a hammer. For every metal there is a temperature of greatest malleability. The following is the order of malleability of the metals: Gold, silver, copper, platinum, iron, aluminum, tin, zinc, lead.

MALLEABLE GLASS. See GLASS, MALLEABLE.

MALLECO, māl-yā'kō, Chile, a province bounded by Argentina, Cautin, Bio-bio and Arauco. It has an area of 3,303 square miles. The capital city is Angol. The province is mountainous and well wooded in the eastern and western parts. About one-half of the population is composed of Indians of the Arauco tribe. Wheat is the staple agricultural product of the country. The other industries of importance are cattle raising and timber cutting. Pop. 133,212.

MALLEE-BIRD, or **MALEO,** a name for the Australian mound-bird (q.v.), derived from a native language.

MALLERY, Garrick, American ethnologist: b. Wilkesbarre, Pa., 23 April 1831; d. Washington, D. C., 24 Oct. 1894. He was graduated from Yale College in 1850 and was admitted to the bar in 1853; he practised law in Philadelphia until 1861, when he enlisted and served through the war in the Federal army, attaining the rank of lieutenant-colonel. He was executive officer of the Signal Service Bureau until 1876, when he was engaged in a geological survey in Dakota, and in 1879 was retired from the army and appointed chief of the bureau of ethnology. Among his books are 'A Calendar of the Dakota Nation' (1877); 'Israelite and Indian, a Parallel in Planes of Culture' (1889); 'Greeting by Gesture' (1891); 'Picture Writing of the American Indians' (1893), etc.

MALLESON, George Bruce, English soldier and historical writer: b. London, 8 May 1825; d. there, 28 Feb. 1898. He was educated at Winchester College, and from 1842 till 1877 served in India, at first in the army, and subsequently in government posts. His chief work, 'History of the Indian Mutiny' (1878–80) commenced where the second volume of Kaye's 'Sepoy War' left off, and in 1890 there appeared a joint edition of the two histories in six volumes, the third volume of Kaye's work being omitted and a new sixth one added. Other works by him are 'The Mutiny of the Bengal Army' (1857); 'History of the French in India' (1868); 'Sketch of the Native States of India' (1875); 'Final French Struggles in India and Indian Seas' (1878); 'History of Afghanistan' (1879); 'The Decisive Battles of India' (1883), and lives of 'Clive'; 'Eugene of Savoy'; 'Prince Metternich'; 'Wellesley'; 'Dupleix'; 'Akbar' and 'Warren Hastings.'

MALLET, John William, American chemist: b. Dublin, Ireland, 10 Oct. 1832; d. 1912. He was educated at Trinity College, Dublin, and at Göttingen, and emigrating to the United States in 1853 became assistant professor in chemistry at Amherst 1854–56 and later chemist to the United States geological survey of Alabama. In 1856–60 he was professor of chemistry at the University of Alabama. He entered the service of the Confederacy and was paroled in 1865 as lieutenant-colonel of artillery. The chair of sciences at the University of Louisiana was occupied by him in 1865–68 and after 1868 he was professor of chemistry in the University of Virginia, becoming professor emeritus in 1908. He contributed valuable scientific articles to the leading chemical periodicals and published 'Cotton' (1862); 'Chemistry Applied to the Arts' (1868); 'Syllabus of a Course of Lectures on General Chemistry' (1890; rev. ed., 1901).

MALLET, a wooden hammer used in carpentry and also in the game of croquet (q.v.). The gavel is a variety of mallet. Various small mallets are used by gold beaters, jewelers, dentists and other artisans.

MALLIAN, mā-yăn', **Julien de,** West Indian dramatist: b. Le Moule, Guadeloupe, 1805; d. Paris, France, 1851. He gained wide reputation as a writer of comedies and dramas, many of which have been presented on the metropolitan stage. The most popular are 'Two Roses' (1831), a historical drama of the civil wars in England; 'The Carpenter' (1831), a comedy; and 'The Wandering Jew' (1834).

MALLOCK, William Hurrell, English author: b. Devonshire, 1849. He was graduated from Balliol College, Oxford, and won the Newdegate prize in 1872. He has never entered a profession but has devoted himself entirely to literary work. His philosophical and sociological writings include 'Is Life Worth Living?' (1879); 'Social Equality, a Study in a Missing Science' (1882); 'Atheism and the Value of Life' (1884); 'Property and Progress' (1884); 'Labour and the Popular Welfare' (1893); 'Studies of Contemporary Superstition' (1895); 'Classes and Masses' (1896); 'Aristocracy and Evolution' (1898); 'Doctrine and Doctrinal Disruption' (1900); 'Religion as a Credible Doctrine' (1902); 'The Reconstruction of Belief' (1905); 'The Nation as a Business Firm,' and 'Social Reform' (1914). He has also written several works of fiction, most of which deal with the same social and religious problems as the above works, including 'The New Republic' (1877), in which he introduces many

well-known contemporaries under thin disguises; 'A Romance of the Nineteenth Century' (1881; new ed., 1894); 'The Old Order Changes' (1886); 'A Human Document' (1892); 'The Heart of Life' (1895), and 'The Individualist' (1899), and has published two volumes of verse, 'The Veil of the Temple' (1904); a translation of Lucretius' 'On Life and Death' (1878), and 'An Immortal Soul' (1908). His philosophical works deal with the fundamentals of religion, arguing for supernaturalism and aiming to show that science alone supplies no basis for religious belief; in his political and economic writings he has attacked the radical and socialistic theories and tendencies of the age. In 1916 he was awarded a Civil List pension.

MALLOPHAGA, a name used for an extensive and varied assembly of feather-eating and hair-eating bugs, usually called lice. They are very small, oval, delicate and of swift motion; of light-brown color, some with shovel-shaped heads, others with horn-like appendages on the head. One delicate kind vexes the canary, gluing eggs to its feathers and in the cracks of its perch. *Goniocotes* is a large form, a tenth of an inch long, with bristled and shield-like head, and is one of the pests of domestic fowls. One species, colored with bands of yellow and brown, infests the turkey and the peacock. Another great family, *Liotheidæ*, contains species which resemble white ants and preys upon the feathers of falcons and of wading birds. *Gyropus* infests guinea-pigs, massing thickly about their neck and ears.

MALLORY, Stephen Russell, American lawyer: b. Trinidad, West Indies, 1813; d. Pensacola, Fla., 9 Nov. 1873. His parents removed with him to the United States in 1820 and he was educated in Mobile and in Nazareth, Pa. He studied law and was admitted to the bar in 1839; he was United States senator 1851–57 and in 1861 entered the service of the Confederate States as secretary of a navy not in existence. He was arrested at the close of the war and held for 10 months, after which he returned to Pensacola and was until his death engaged in law practice.

MALLOW, a genus of herbs (*Malva*), of the family *Malvaceæ*. The species, of which there are less than a score, are widely scattered and are characterized by angled, lobed or dissected leaves and solitary or clustered axillary flowers. They include four species cultivated in America and one very well-known weed, *M. rotundifolia*, popularly known among children as "cheese-plant" because of the shape of the fruits, which also suggested another popular name, "shirt-button plant." The plant is a perennial, very persistent of life and rather difficult to eradicate except by constant clean cultivation. Musk-mallow (*M. moschata*) is cultivated for its large, showy pink or white flowers; *M. alcea* is also popular. *M. crispa* furnishes a useful fibre, as probably other species could be made to do. Its leaves are often used for garnishing but are not eaten. This species and *M. sylvestris* are frequently seen in old gardens and in their vicinity as escaped plants, but are not offered for sale by seedsmen. The name mallow is loosely applied to many plants of the mallow family, but not of the genus *Malva*; for instance, marsh-mallow (*Althæa officinalis*), rose-mallow (*Hibiscus moscheutos*) and Indian mallow (*Abutilon abutilon*); also, more loosely still, to unrelated plants, as Jew's mallow (*Corchorus olitorius* or *C. capsularis*). See CORCHORUS; HOLLYHOCK; HIBISCUS.

MALMAISON, mäl-mā-zôñ, a celebrated French château on the Seine, 10 miles west of Paris. It was the favorite residence of Josephine, wife of Napoleon I, and here she died. The château belonged to Richelieu, and was restored in 1861 by Napoleon III. In 1870 a sortie by Ducrot from Paris was repulsed here by the Germans.

MALMESBURY, mämz'bĕr-ĭ, **James Harris**, 1ST EARL OF, English diplomatist: b. Salisbury, England, 21 April 1746; d. London, 21 Nov. 1820. He was educated at Merton College, Oxford, afterward studied at Leyden and in 1768 became secretary of legation at Madrid. He was Ambassador at Berlin 1772, in 1777 at Saint Petersburg and in 1784 at The Hague. In 1788 he was created Baron and in 1800 Earl of Malmesbury. In 1793, with other Whigs, he deserted Fox for Pitt, and in 1795 was the Prince of Wales' proxy at the marriage ceremony in Germany of the Princess Caroline of Brunswick. Consult 'Diaries and Correspondence' (1845); 'Lord Malmesbury and his Friends' (1870). (Both works edited by J. H. Harris, his grandson).

MALMESBURY, William of. See WILLIAM OF MALMSBURY.

MALMESBURY, England, market town and municipal borough, Wiltshire, 94 miles west of London, on the Great Western Railway. It is built on a ridge of land almost surrounded by the river Avon and one of its small tributaries. Its site was chosen by a Scottish or Irish monk named Maildulphus for a hermitage in 635. He later gathered a colony of disciples about him, one of whom, Adhelm, became abbot of the abbey founded there, ruins of which still remain. Athelstan rebuilt the monastery and is buried there. The town grew around the abbey, but was not incorporated until 1645, the charter then granted remaining in force until 1885. The modern town has a considerable agricultural trade, manufactures silk and pillow lace, and has tanneries and breweries. Two miles distant is the manor-house of Sir Lawrence Washington, and the church at Gardson where many members of the Washington family are buried. Pop. 2,656.

MALMIGNATTE, măl-mĭ-nyăt', a spider. See LATRODECTUS.

MALMÖ, mäl'mė, Sweden, a seaport and the third largest town of the country, on the Sound, almost opposite Copenhagen, 17 miles distant, with which it has steam-ferry communication, a channel being maintained in winter by an ice-breaker. Malmö is a busy industrial centre with important manufactures, is the terminus of several railroads and is 384 miles by rail southwest of Stockholm. The town and its harbor have been considerably improved and modernized, and an extensive export and import trade is carried on. Malmö dates from the 12th century, but until 1500 it was little more than a poor fishing village. It again suffered a period of decline but revived after the improvements to the harbor effected in 1775. Pop. 111,823. It has an interesting city hall, Saint

Peter's Gothic Church and an ancient castle. The industries include iron works and foundries, manufacture of railroad cars, shoes, gloves, tobacco, chocolate, etc.

MALMSEY, măm'zĭ or mălm'sĭ, a sweet wine, made from a grape grown on rocky ground, in Madeira, exposed to the full influence of the sun, and not gathered until partially withered.

MALOLOS, mä-lō'lōs, Philippines, a pueblo and the capital of the province of Bulacán, Luzon, situated at the head of one of the inlets of the Pampanga River delta, five miles northwest of Bulacán, the former capital. It is a telegraph and military station, is near a station of the Manila-Dagupan Railroad and is the centre of an important trade. It is in a region which was a stronghold of the insurgents, and immediately after the close of the Spanish war was made the capital of the insurgent government. Rice is extensively cultivated in the vicinity. Pop. 12,575.

MALON, măl'on, **Benoît**, French Socialist: b. near Sainte-Etienne in the department of Loire, 23 June 1841; d. Asnières, 13 Sept. 1893. He early entered upon a journalistic career and his activities in behalf of Socialistic agitations caused his enforced absence from France for a time preceding 1880. He then founded the *Revue Socialiste* which he edited until his death. He attained considerable influence through the breadth of his teachings, which advocated the necessity for an inclusion of certain high religious, ethical and moral considerations with the socialistic principles of government. Author of 'L'Internationale, son histoire et ses principes' (1872); 'Histoire du Socialisme et des prolétaires' (1881–84); 'Le socialisme intégral' (1890–91, etc.

MALONE, mą-lōn', **Edmund**, Irish Shakespearean scholar: b. Dublin, 4 Oct. 1741; d. London, 25 April 1812. He was educated at Trinity College, Dublin, and was called to the Irish bar in 1767, but henceforth devoted himself entirely to literary pursuits. His most important and permanent critical works are 'Attempt to Ascertain the Order in Which the Plays of Shakespeare Were Written' (1778), which still carries authority; his edition of the poet in 10 volumes; and the edition known as the Third Variorum, which was prepared after his death by James Boswell, the younger, out of material left by the critic, and published in 21 volumes. This last is still the best of all complete critical editions. He also published 'Remarks on the Rowley (Chatterton) Controversy'; 'An Inquiry into the Ireland Shakespearian Forgeries'; and biographical memoirs of Sir Joshua Reynolds, Dryden, W. Gerard Hamilton, etc. Consult Prior, James, 'Life of Edmund Malone' (London 1864); Leslie and Taylor, 'Life of Sir Joshua Reynolds' (ib. 1865) and Boswell, James, 'Life of Johnson,' edited by G. B. Hill (Oxford 1887).

MALONE, Walter, American poet and jurist: b. Desoto County, Miss., 10 Feb. 1866; d. Memphis, 18 May 1915. He was graduated at the University of Mississippi and subsequently engaged in the practice of law and in literary work. He contributed to the periodicals of the day and published 'Claribel and other poems' (1882); 'The Outcast' (1886); 'Narcissus' (1893); 'Dusk and Dawn' (1895); 'December and June' (1896); 'Coming of the King' (1897); 'Songs of North and South' (1900); 'Poems' (1904); 'Songs of East and West' (1906); 'Hernando DeSoto,' an epic poem highly praised (1914).

On 29 March 1905, on petition of practically all members of the Memphis bar, he was appointed judge of the Circuit Court of Shelby County and held the position until his death. An association composed of members of many States has been formed to erect a bronze portrait statue to Walter Malone in the principal park of Memphis; while another association has for its object to have his "Opportunity" cast into a bronze tablet to be erected in Court square, in the heart of Memphis.

MALONE, N. Y., village, county-seat of Franklin County, on the Salmon River, and on the New York Central and the Rutland railroads, about 275 miles north by west of Albany, and 12 miles from the boundary between the United States and Canada. It is situated at the northern foot-hills of the Adirondack Mountains, in an agricultural region, the chief products of which are hops, hay and potatoes. The dairy products and poultry are important. The chief manufactures are paper, pulp, flour, lumber, leather, woolen goods, foundry and machine-shop products, sash, doors and blinds, men's clothing, cigars and dairy products. The electric-light and gas plants are owned by private companies, the waterworks by the village. The local lighting companies have harnessed the Salmon River eight miles south of Malone, and furnish an enormous supply of power. Malone is the commercial centre for the greater part of Franklin and parts of the adjacent counties, a section having a population of about 50,000. There are two national banks, six fine churches, a high school building (formerly Franklin Academy), several grammar and primary schools, a new federal post office and customs building, county courthouse, jail, a State armory, good hotels and several wholesale establishments. The educational institutions, besides the public schools, are a State School for Deaf-Mutes and Saint Joseph's Academy. There are three public libraries; the Wead Library, 7,000 volumes, free to the people of the school district, is housed in a beautiful building donated by Mrs. S. C. Wead; the Wadhams Library, 2,000 volumes, established and maintained by a literary society, free to all the people of the town of Malone (several school districts), and the Franklin County Historical Society Library, established in 1902. There is a well-kept park. The place was named in honor of Edmund Malone (q.v.), an Irish barrister and writer, by his friend, William Constable, who, together with his wife, named many of the places located within the limits of the large tract of land in the northern part of New York known as "The Macomb Purchase." The first settlement was made in 1802, and its first inhabitants were mostly from Vermont and Ireland. In 1829–30 the people began considering the founding of an academy, and a number of the farmers pledged their farms as security for the payment of the debt incurred for the erection of the building, and Franklin Academy was established in 1831. The Northern Railroad, now Rutland Railroad, entered the town in 1851, and

the New York Central in 1892. Malone figured prominently in the War of 1812; and furnished a large number of soldiers, privates and officers, in the Civil War. The village was the scene of two Fenian (q.v.) gatherings. Pop. 6,500.

MALOO CLIMBER. See BAUHINIA.

MALORY, Sir Thomas, author of the English prose romance 'Morte d'Arthur.' The work was finished in the ninth year of Edward IV's reign, 1470, and published by Caxton in black-letter folio, in 1485. Little is known of the author; he may have been a priest; Caxton calls him "a servant of Jesus both day and night," and priests frequently were accorded the title "Sir." Probably he was a Welshman. See ARTHURIAN ROMANCES; MORTE D'ARTHUR; GRAIL, THE HOLY; LANCELOT OF THE LAKE; MERLIN; TRISTAN.

MALOT, mä-lō, **Hector Henri,** French novelist: b. La Bouille, near Rouen, France, 20 May 1830; d. Vincennes, 18 July 1907. He studied law, but abandoned it for a literary career, and in 1859 issued the first of a long series of successful novels. He was for a time newspaper correspondent in London, and literary critic of *L'Opinion Nationale.* He wrote 'Victimes d'amour' (1859); 'Sans famille,' published in English as 'No Relations' (1878); 'Conscience' (1888); 'Complices' (1893); 'En famille' (1893); 'Amours de jeune; Amours de vieux' (1896); an autobiography, 'Le Roman de mes Romans' (1896).

MALPIGHI, mäl-pē'gē, **Marcello,** Italian anatomist: b. Crevalcuore, Italy, 10 March 1628; d. Rome, 29 Nov. 1694. He received a medical education in Bologna and was granted a doctor's degree in 1653. In 1656 he became professor of medicine at Pisa, where he formed a friendship with the mathematician Borelli, who encouraged him to proceed with researches in anatomy. His health failing he returned to Bologna and continued his investigations, which resulted in discoveries which established facts undisputed in the modern world of science and placed the world's knowledge of physiology on a new footing; his researches in botany and entomology were highly important. In 1691 he was summoned to Rome as first physician to Innocent XII, in which office he died. He published numerous scientific works of great value, a complete edition of which was published in Venice 1743. The principal of these are 'Observations Anatomicæ' (1661) and 'Epistolæ Anatomicæ' (1665).

MALPLAQUET, mäl-plä-kā, **Battle of,** the bloodiest in the war of the Spanish Succession, gained by Marlborough and Eugène, the commanders of the allies, against the French under Villars, 11 Sept. 1709. The French lost 10,000; the allies more than 20,000. Malplaquet is a village in the department of the Nord, near the Belgian frontier, 20 miles east of Valenciennes. After the victory there the allied armies soon took Mons and Douai.

MÄLSTROM. See MAELSTROM.

MALT AND MALTING. See BREWING AND MALTING.

MALSTATT-BURBACH, Prussia, town in the Rhine province, on the Saar and opposite Saarbrücken. It is situated in a coal-mining district and is almost entirely given over to factories and workmen's dwellings. There are manufactories of iron, steel and cement, machinery, boilers and safes. It has a large wharf for handling the exports in coal. Malstatt received municipal rights in 1321, but these were later surrendered. The town began to grow in middle of the 19th century and in 1874 it joined with Burbach to form a city. Pop. about 38,554.

MALT REFUSE, MALT SPROUTS. See NUTRITION OF FARM ANIMALS.

MALTA, mäl'ta, an island in the Mediterranean, belonging to Great Britain, with its dependencies, Gozo, Comino and Cominetto, forming the elevated portions of the plateau that extends northwestward to Sicily, 62 miles, and southward to Africa, 197 miles, and divides the Mediterranean into two basins. The Maltese group has a total area of 118 square miles, of which 91 square miles belong to Malta. Malta is of irregular oval shape, 17 miles long, with a central breadth of nine miles; its greatest elevation is over 750 feet. It is of limestone formation, and is deeply indented on all sides except the south, where the coast forms a continuous and almost unbroken line. Of great strategical importance, it is very strongly fortified, especially Baletta, the capital, which is the headquarters of the British Mediterranean fleet and the principal naval and mercantile coaling station in the Mediterranean. Since the recent regrouping of the British fleet consequent on the rise of Germany as a sea power and the concentration of the main battleship strength in home waters, Malta has declined to a more secondary place. The island is a valuable sanatorium for troops employed in the Orient. The climate is hot in summer, and enervating when under the influence of the humid sirocco blowing from Africa, but generally is mild and healthful. There are only a few small streams, but the springs are so numerous and copious that no deficiency of water is felt, and since 1880 an extensive system of waterworks has greatly improved sanitary conditions. Malta has a bare, stony appearance owing to the absence of trees. The soil is thin but remarkably fertile; and its fertility is increased by the skilful cultivation and the diligent toil of the inhabitants. Large crops of wheat and potatoes are raised, early varieties of the latter being largely exported to England; maize, barley, cotton, cloves, oranges, figs, grapes, carob beans and peaches and other fruits are also grown. Filigree ornaments and a little cotton are manufactured. Sheep and goats are kept, with smaller numbers of cattle, mules, asses and horses. The language of the people is a dialect of Semitic origin derived from the Carthaginian and Arabic tongues, with a strong admixture of Italian. The native population believe themselves to be of Phœnician descent. Italian is the language of the law courts. Most of the educated Maltese speak Italian, and some speak English; the peasantry as a rule know neither the one nor the other. The Maltese are a sober, industrious race of people, though quick-tempered and ignorant. They are proud of their island home — they love to call it "the flower of the world" — and are devout Roman Catholics. The administration is vested in a governor and an executive council of which the governor is president, and

there is also a legislative council, partly elective. The number of vessels entered in 1914–15 was 2,204, with a tonnage of 3,852,767. The imports were valued at £2,069,817, and the exports £662,412. Pop. including British troops and their families, 228,534. Malta has great historical, archæological and architectural interest. Saint Paul's Bay is accepted as the scene of the wreck of the Apostle Paul (A.D. 58), as recorded in Acts xxvii, xxviii. It passed successively through the hands of Phœnicians, Greek and Carthaginians, and was finally attached to Rome during the Second Punic War. Relics of these various occupations exist throughout the island. After the fall of the Roman Empire it was seized at different times by Vandals, Goths and Saracens. From the last it passed to Sicily, and followed its fortunes till 1522, when Charles V granted it to the order of Saint John of Jerusalem, the Knights of Saint John of Malta being distinguished during successive centuries for their bold defense of Christianity against Moslem assaults. In 1798 the grand-master surrendered Valetta without defense to Napoleon. Shortly afterward the inhabitants regained it and asked for a British protectorate, which was confirmed in 1814 by the Congress of Vienna. Consult Ballou, 'The Story of Malta' (1893).

MALTA, Knights of. See JOHN, ORDER OF SAINT.

MALTA FEVER (also MEDITERRANEAN FEVER, NEAPOLITAN FEVER, ROCK FEVER, etc.), a disease occurring near the Mediterranean shores, in which the fever symptoms are accompanied by intense pain, enlargement of the spleen, swelling of the joints, excessive perspiration and other conditions tending to bring about extreme weakness and loss of functional activity. Its cause is now assigned to *Micrococcus melitensis*. Treatment thus far is not specifically determined. Hygienic care, such as is normal in fevers, with special attention to diet and bathing, together with ordinary applications for reducing swellings, is all that can be recommended.

MALTBIE, mâlt'bĭ, **Milo Roy,** American municipal and public utility expert: b. Hinckley, Ill., 3 April 1871. He was graduated from Upper Iowa University in 1892 and took the degree of Ph.D. at Columbia in 1897. He was professor of economics and mathematics at Mount Morris College, Illinois, in 1893–95; from 1897–1902 was secretary of the Reform Club Committee on City Affairs; from 1897–1903 was editor of *Municipal Affairs*; from 1902–07, secretary of New York Art Commission. In 1906 he investigated public utilities in Great Britain for the National Civil Federation; from 1907–15, he was member of Public Service Commission for the 1st district, New York; since 1915, public utility expert and member of Advisory Board to the Interstate Commerce Commission on Railroad Valuation. Has devoted himself to the study of municipal and utility questions, going abroad in 1899 to investigate foreign cities and their problems. He was lecturer on municipal government at Columbia University in 1900. He has written 'English Local Government of To-Day' (1897); 'Municipal Functions' (1898); 'Street Railways of Chicago' (1901), and numerous reports upon various matters.

MALTE-BRUN, mâl'tĕ-broon (Fr. mâltbrŭn), **Conrad** (properly MALTHE BRUNN), Danish geographer: b. Thisted, Jutland, 12 Aug. 1775; d. Paris, 14 Dec. 1826. He devoted himself to literature and politics in Copenhagen, but having given offense by writing in favor of the liberty of the press and the enfranchisement of the peasants, was banished to Sweden in 1800. He went later to Paris, where he became famous as a geographer. He edited the foreign political department of the *Journal des Debats*, but is best known for his 'Summary of Universal Geography' (8 vols., 1810–29). The first six volumes only were completed by Malte-Brun. Among his other works are 'Ancient and Modern Poland'; 'History of Travel,' and 'Mathematical, Physical and Political Geography.'

MALTESE (mâl-tēs' or -tēz') **CROSS.** See CROSS.

MALTESE DOG. See DOG.

MALTHA, (1) according to Pliny, a name used for an inflammable mud which flowed from a pool at Samosata, Commagene, North Syria, and resembled naphtha. (2) A mixture of wax and pitch for caulking ships; mineral tar is another name for maltha, which is found oozing from rocks in certain localities, particularly in California.

MALTHUS, Thomas Robert, English political economist: b. near Guildford, Surrey, 14 Feb. 1766; d. Bath, 29 Dec. 1834. He studied theology at Cambridge and was ordained in the Church of England, continuing to pursue his profession as a teacher while holding a small living in Surrey. In 1805 he was appointed professor of history and political economy at Haileybury College. In his famous 'Essay on the Principles of Population' he propounded (1798) what is known as the Malthusian Doctrine, namely, that the increase of population advances at a geometrical, the increase of the means of life at an arithmetical, ratio that this condition of things renders the condition of the poor more and more hopeless, that unless famine or war interfere to diminish population the means of life will eventually prove inadequate; that discouragement of early and improvident marriages and the cultivation of self-restraint must be employed to avert the danger. These positions have been the subject of long and widespread discussion. His other writings include 'An Inquiry into the Nature and Progress of Rent' (1815); 'Principles of Political Economy' (1826); 'Definitions in Political Economy' (1827). Consult Bonar, 'Malthus and His Work' (1885); Soetbeer, 'Die Stellung der Sozialisten zur malthusischen Bevölkerungslehre' (1886); Molinari, 'Malthus, Essai sur le Principe de Population' (1889); Cossa, 'Il principio di populazion di T. R. Malthus' (1895). See ECONOMICS.

MALUS, Etienne Louis, ā-tē-ĕn loo-ē mālŭs, French physicist and military engineer: b. Paris, 23 June 1775; d. there, 23 Feb. 1812. He was educated at the École Polytechnique, and upon leaving the school received a captain's commission in the corps of engineers, and served during the campaign of 1797 with the army of the Sambre and Meuse. Subsequently he participated in the campaign in Egypt, and in 1804 superintended the construction of forti-

fications at Antwerp and Strassburg. Whatever time could be spared from his professional labors was devoted to scientific pursuits. His chief publications consist of a mathematical 'Traité d'Optique,' first published in the 'Mémoires présentés à l'Institut' in 1810, in which he promulgated some valuable discoveries respecting the refraction of light in transparent media; and the 'Theory of Double Refraction' (Mémoires présentés à l'Institut, Vol. II), containing an account of his discoveries respecting the polarization of light, which consisted in showing that light may acquire properties identical with either of two rays yielded by refraction through Iceland spar by the process of simple reflection at a particular angle from any transparent body. This discovery gained for its author his election to the Institute and the biennial medal of the Royal Society of London. He also published an 'Essay on the Measurement of the Refractive Force of Opaque Bodies.'

MALVACEÆ, a family of flowering plants, the mallows and their allies, in the order *Columniferæ,* with the calyx gamosepalous; petals contorted in a bud, stamens numerous, monadelphous; anthers extrorse, monothecious; pollen-grains spiny. They are herbaceous or woody plants, mucilaginous in their juices, and usually densely hairy, especially when young. The leaves are palmately nerved and frequently deeply five-lobed. The flowers are large, funnel-shaped, conspicuously and beautifully colored, attracting the aid of insects in fertilization. The fruit is schizocarpous. This family contains many important genera and species of plants elsewhere described, such as the mallows (*Malva, Lavatera,* etc.), hollyhocks (*Althæa*), cotton-plants (*Gossypium*), the rose-mallows (*Hibiscus*), etc. About 60 genera and 900 species are accredited to this family by systematic botanists.

MALVERN, măl-vèrn, Ark., town, county-seat of Hot Springs County, on the Saint Louis, Iron Mountain and Southern Railroad, about 20 miles southeast of Hot Springs. It is in an agricultural region, in which the principal products are cotton and fruit. The chief manufactures are flour, lumber, chairs, doors, windows, ice and bricks. The trade is principally in lumber, cotton and fruits. Pop. 2,778.

MALVERN, mâl'vèrn, **Great,** Egland, a fashionable inland watering-place in Worcestershire, on the east side of the Malvern Hills, at the foot of the Worcestershire Beacon, 1,395 feet high, the summit of which commands magnificent views. A restored 11th century priory church and Malvern College are the chief edifices. Malvern is widely celebrated and greatly frequented owing to its salubrious climate and the efficacy of its mineral springs. Pop. of urban district about 16,513.

MALVERN HILL, Battle of. After the close of the battle of Glendale (q.v.), 30 June 1862, the Army of the Potomac was put in position on Malvern Hill, an elevated open plateau on the left bank of James River, 60 feet high, and about 1½ miles by ½ mile in area. On this plateau the army was disposed in a large arc, both flanks resting on the river and protected by gunboats. Porter's Fifth corps was on the left, Couch's division of Keyes' corps on the right of Porter, Heintzelman's two divisions — Kearny and Hooker — on the right of Couch, Sumner's corps on the right of Heintzelman, and Franklin's corps on the right of Sumner. Peck's division of Keyes' corps was on the right of Franklin and was the extreme right of the army, and it and the left of Porter's line stood back to back. There were numerous batteries of artillery along and in rear of the line. The position was a very strong one: the Confederate D. H. Hill says: "Tier after tier of batteries were grimly visible on the plateau rising in the form of an amphitheatre." The approach to the position was over 400 to 500 yards of open ground swept by artillery fire. When it was discovered early in the morning of 1 July that McClellan had fallen back from Glendale during the night, Lee gave orders for immediate pursuit. Jackson marched by the Willis road, and when in sight of Malvern Hill he formed line, with Whiting's division on his left and D. H. Hill's on his right, one of Ewell's brigades occupying the interval. The rest of Ewell's division and Jackson's own division were held in reserve. Magruder was directed to take position on Jackson's right, but before his arrival two of Huger's brigades came up and were placed next to Hill. The Confederates felt the Union lines with infantry and artillery, and when Magruder came up, about 2 P.M., Huger's two brigades — Armistead and Wright — with four batteries, were ordered forward. The batteries, as they emerged in succession from the woods, were promptly knocked to pieces by the fire of over 60 guns brought to bear upon them, and the two brigades were repulsed with loss. This attack fell upon the right of Porter and left of Couch, and the latter was now reinforced by Caldwell's brigade of Sumner's corps. No serious advance had been made on other parts of the line, but Hill had suffered severely from artillery fire in getting his troops in position opposite Couch's right. At 5:30 P.M. Magruder assaulted Porter's line and the left of Couch with the five brigades of Armistead, Cobb, Wright, Mahone and Barksdale. All were met by such a terrific fire of artillery and musketry, which swept the slope of the hill, that they could make no headway, though gaining temporary advantages, and fell back with great loss. Toombs', G. T. Anderson's and Ransom's brigades were now ordered in; Toombs got lost in the thick woods; Anderson and Ransom shared the fate of those preceding them, and fell back. Magruder's fight ended before dark. While Magruder was thus engaged with Porter and the left of Couch, D. H. Hill, on his left, advanced against Couch's right, which, as the action progressed, was reinforced by Caldwell's brigade, three regiments of Hooker's division under Sickles and some of Kearny's division. Hill's five brigades were commanded by Generals Garland and Ripley and Cols. J. B. Gordon, A. H. Colquitt and C. C. Tew. The slope to Couch's line was about 800 yards, without cover, and the advance directly in the face of guns on the slope and bristling on the summit, from which burst forth such a terrific fire of shell and canister that Hill's brigades withered under it. Toombs' brigade was picked up and sent to their support, but the six brigades were hurled back, some in great disorder after the loss of half their men.

Later in the evening Taylor's brigade of Ewell's division, on Hill's left, moved against the left of Kearny's division, and was repulsed by artillery fire alone. Half an hour after Hill had been disastrously repulsed and his troops scattered, McLaw's division of two brigades — Semmes and Kershaw — came up and assaulted Porter's right. Semmes made some headway up the slope, but was met by the 69th and 88th New York of Meagher's brigade, which Sumner had sent to Porter's assistance, and was repulsed after a hand-to-hand encounter. Kershaw, on Semmes' left, was likewise repulsed, and his repulse at twilight marked the close of the battle, but it was 9 o'clock before the firing ceased and quiet settled down on the bloody field. Sixteen Confederate brigades had heroically thrown themselves against the Union left, but were repulsed by the artillery and nine brigades. Advanced regiments were forced back, but generally recovered ground; batteries or parts of batteries were withdrawn, but again run forward; yet "never for an instant was the Union line broken or the guns in danger." The Confederate loss was over 5,500; Jackson's four divisions had 2,301 killed, wounded and missing; Magruder and Huger about 2,900. The Union loss was less than 2,000. Consult 'Official Records' (Vol. XI); Webb, 'The Peninsula'; 'McClellan's Own Story'; Allan, 'History of the Army of Northern Virginia'; The Century Company's 'Battles and Leaders of the Civil War' (Vol. II).

E. A. CARMAN.

MALVERN (mâl'vėrn) **HILLS,** England, a range of picturesque hills on the borders of Worcester and Hereford shires. It extends north and south for about nine miles, and attains an altitude of 1,395 feet in the Worcestershire Beacon.

MAMANUA, mä-mä'noo-ä, a Negrito people of the Philippines living in the interior of Surigdo Peninsula, island of Mindanao. Large numbers of them have been converted to Christianity by the Jesuit missionaries.

MAMARONECK, mą-măr'ō-nĕk, N. Y., town, in Westchester County, on Long Island Sound, and on the New York, New Haven and Hartford Railroad, about 11 miles east of New York and 21 miles from Grand Central Station, New York City. The town includes the village of Larchmont and part of the village of Mamaroneck. It is a residential section, in which many New York City people have homes. There are but few industrial establishments; the principal are the National Machine Company, manufacturing sewing machines and sewing machine attachments, rubber goods factory, pumice-stone mill and a gutta-percha plant. It is the headquarters of the Larchmont Yacht Club. Pop. 5,699. The population of Larchmont is about 2,000.

MAMARONECK RIVER. See BOUNDARIES OF THE UNITED STATES.

MAMBAJAO, măm-bä'how, a town of the province of Misamis, Mindanao, situated on the northwestern coast of Camiguin Island, which lies off the northeast coast of Mindanao. Pop. 14,500.

MAMBER, a widely diffused colloquial name, for the common wild goat (*Capra ægagrus*) of southwestern Asia. See GOAT.

MAMBUSAO, măm-boo'sä-ō, Philippines, a pueblo of the province of Cápiz, island of Panay, on the Cápiz River, opposite Ibajay and 17 miles southwest of Cápiz, the provincial capital. Pop. 8,300.

MAMELUKES, măm'ē-lūks, **MAMLOUKS,** or **MAMALUKES** (from the Arabic *memalik,* a slave), in Egypt, slaves from the Caucasian countries, who from menial offices were advanced to dignities of state. When Genghis-Khan made himself master of the greatest part of Asia in the 13th century, and carried vast numbers of the inhabitants into slavery, Nedjmeddin (Malek Salah), sultan of Egypt, bought 12,000 of them, including natives of Circassia, but chiefly Turks, from Capchak (Kipzak), had them instructed in the military exercises and formed a regular corps of them. They soon exhibited a spirit of insubordination and rebellion. Under his successor they interfered in the government, assassinated the sultan, Turan Shah, and in 1254 appointed Ibegh, one of their own number, sultan of Egypt. The dominion of the Mamelukes in Egypt continued 263 years. During this period they made some important conquests, and in 1291 they drove the Franks entirely out of the East. From the middle of the 18th century the number and wealth of the Mamelukes gave them such a superiority over the Turks in Egypt that the pasha appointed by the Porte was obliged to conform entirely to their wishes. This superiority was owing, principally, to Ali Bey, who ruled with unlimited power from 1766 to 1773, when he was assassinated. The Mameluke beys, especially Murad Bey, played an important part at the time of the French invasion. The Mamelukes, who were scattered throughout Egypt, and estimated at 10,000 or 12,000 men, maintained their numbers, principally by slaves brought to Cairo from the regions lying between the Black and Caspian seas. These were compelled to embrace the Mohammedan faith, and were all educated as soldiers. After a time they obtained a share in the government, and some of them even became beys, for none but Mamelukes were capable of holding this office. They formed a fine body of cavalry, and attacked the French, when they landed in Egypt, with the greatest fury; but they were unable to withstand the European artillery, and many of them soon joined the French. The pasha of Egypt, Mehemet Ali, destroyed the Mameluke beys 1 March 1811, by a perfidious stratagem, and immediately afterward ordered a general massacre of the Mamelukes in every province of Egypt. Some hundreds managed to escape into Lower Nubia, where they built a small town, and endeavored to keep up their force by disciplining negroes in their peculiar tactics. They did not succeed, however, and shortly afterward dispersed. (See EGYPT). Consult Makrizi, 'History of the Mameluke Sultans,' translated by Quatremère (3 vols., Paris 1837–41) and Muir, William, 'The Mameluke or Slave Dynasty of Egypt, 1260–1517' (New York 1906).

MAMEY, or **MAMMEE-APPLE.** See MAMMEE APPLE.

MAMEY SAPOTE, a large tree (*Calocarpum mammosum*) of the family *Sapotaceæ,* native of tropical America. The leaves are large, obovate, glabrous, the flowers small and

inconspicuous and the fruit globose or egg-shaped, rusty brown, and three to seven inches long, with a single large seed. The fruit is very popular in the tropics, especially in Cuba, and is sometimes shipped to the United States. It is eaten fresh, or used for sherbets or marmalade. The tree is grown in Florida and California, but so far not very successfully.

MAMMALIA. See MAMMALS.

MAMMALS, a class of animals, known also as beasts, or quadrupeds, the highest of the vertebrate group in the sense that it comprises forms whose organization is on the whole the most efficient on account of the complexity, or perfection, of the various organs and parts. The diagnostic character of the class is the possession of cutaneous glands, which secrete a complex fluid, called milk, for the nourishment of the young. The lower jaw articulates directly with the cranium, without the mediation of a quadrate bone. The occipital condyles, two in number, form part of the exoccipitals. The internal ear contains a series of three or four separate small bones, which are concerned in audition. The heart is four-chambered, with two auricles and two ventricles; a single left aortic arch; blood warm; red blood discs, not nucleated. A muscular diaphragm separates the heart and lungs from the abdominal cavity. With few exceptions, mammals are clothed with hair, a special outgrowth of the epidermis, and even in these exceptional cases isolated hairs are found at some stage of their life.

Mammals as a class are extremely diversified in size, appearance and habits. The structure of some is modified for a purely aquatic life, of others for burrowing in the earth, for flying, for leaping, for running, etc. Some live entirely in the sea, others pass their lives in the treetops and others in subterranean caverns, which they excavate.

All mammals possess limbs, which are normally four in number, but the hind pair is suppressed in the whales and sea-cows. The limbs assume the form of legs for terrestrial progression, wings for flight or paddles for swimming. The class includes man, and the majority of the animals most useful to man, such as the horse, ox, sheep, goat, dog, cat, etc. It includes also the whales, the largest of existing animals. About 600 genera and 5,000 species of mammals (exclusive of fossil forms) are known, of which about 200 genera and 1,200 species occur in North America, north of Panama.

Integuments.— The skin of mammals consists of two principal layers, a superficial one, called the epidermis or cuticle, and a deeper layer, the dermis or corium. The epidermis is again divided into two layers, an external horny layer and a deeper one, called the Malpighian layer. The epidermis is usually quite smooth, and is beset with hairs which are a special outgrowth of this part of the integument peculiar to the class. The cetacea are without hairs, except a few about the mouth. In the pangolins, the epidermis develops large scales which cover the greater part of the body. Epidermic scales of smaller size are found on the tails of various rodents, insectivores and marsupials. The horns of ruminants, the nasal horn of the rhinoceros and all claws, nails and hoofs are also epidermic structures.

The dermis or corium is generally thicker than the epidermis and contains blood-vessels, tactile nerve endings, sweat glands which open on the surface of the body and fatty tissue. In the whales and seals the fat cells are enormously developed immediately below the dermis and constitute the "blubber." In the armadillos bony plates occur in the dermis, forming a carapace or shell. They are covered by horny sheaths. The presence of small hard tubercles in the skin of certain porpoises gives ground for the belief that the ancestors of the cetacea were covered with a bony armor, somewhat like that of the armadillos.

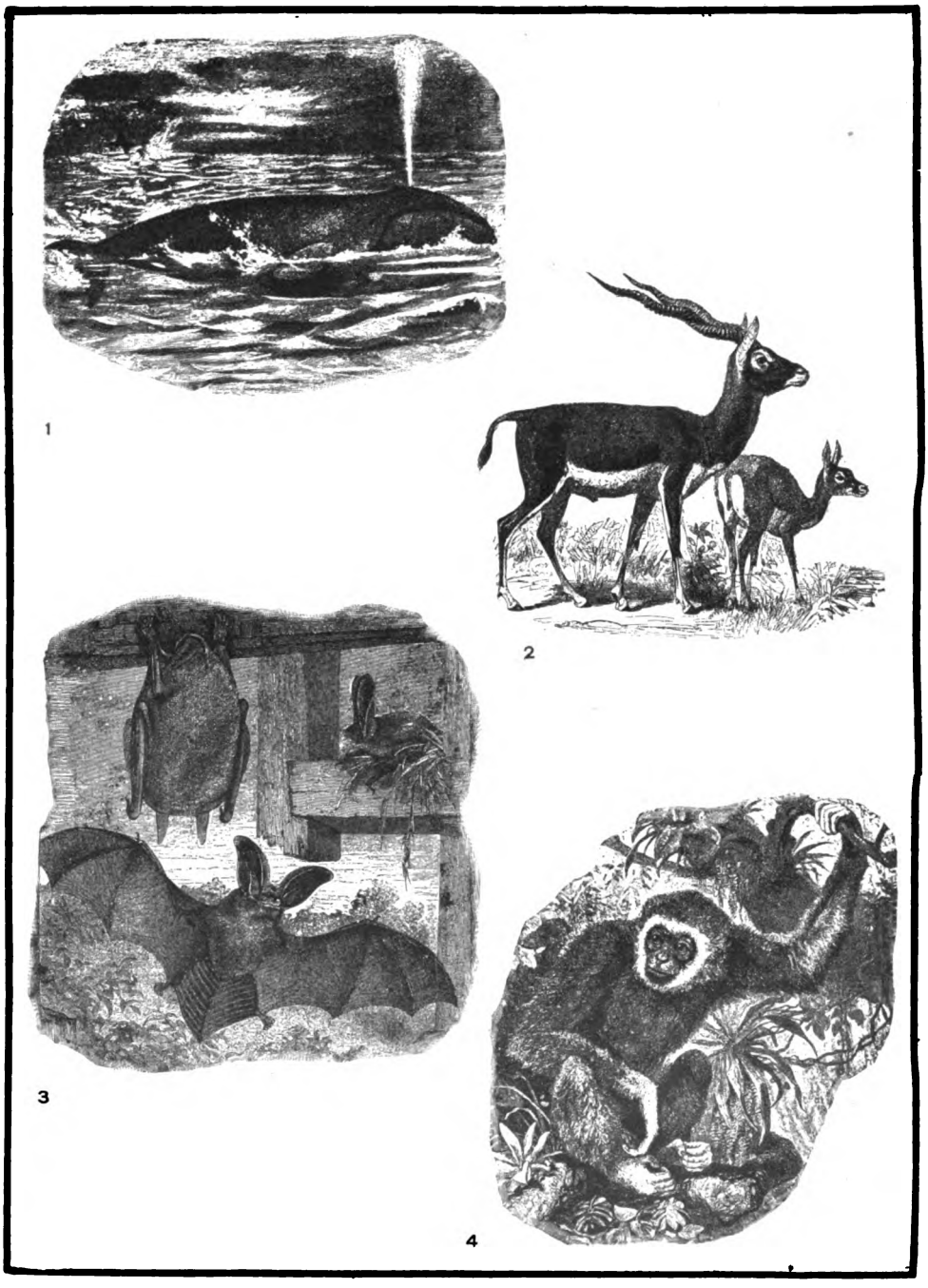
Hair.— True hairs are found only on mammals. They are simple epidermic structures growing from papillæ sunk in the dermis. They consist of central cellular pith, encased in a horny sheath. In some mammals the sheath is rough, and the hair is then capable of being matted together to form "felt." In the majority of mammals the hairy covering consists of coarse long hairs and fine short hairs intermingled, forming the fur. In the porcupines the coarse hairs assume the form of large stiff spines, or quills; in the hogs they are smaller and more flexible, forming bristles. The hairy covering is usually shed once or twice annually, except in the case of man and of the manes and tails of such ungulates as the horse, the hairs of which may persist throughout life.

The majority of mammals have a number of large, long hairs, or vibrissæ, arranged in a definite fashion about the mouth, eyes and ears, which serve to a certain degree as tactile organs. In deer and some other ruminants the hairs consist mainly of the cellular pith and hence are easily broken.

The color of mammals is chiefly due to the pigments contained in the hair, which belong to the class known as melanins. Black, white and brown in various mixtures and shades are the commonest colors. The coloration is chiefly protective, but some such sharp contrasts of black and white as those of the skunks are thought to be warning colors, and the clear white of the under side of the tail of deer, certain hares, etc., to be directive, or distinguishing, marks for the young.

Skeleton.— The skeleton consists of an axial portion, comprising the skull, the backbone or vertebral column, the ribs and the sternum; and an appendicular portion or the skeleton of the limbs. In the skull the bones are bound firmly together by the overlapping or interdigitation of the edges, except the lower jaw, the ossicles of the internal ear and the hyoid, or tongue, bones. In adults most of the sutures are usually obliterated. The snout or rostrum consists of the premaxillary, maxillary, palatine and pterygoid bones below and on the sides, and the nasals above, while within are the median vomer and the ethmoid bones. The rostrum abuts against the brain-case or cranium, which is vaulted, and comprises three segments, an anterior one, consisting of the presphenoid, orbito-sphenoids and frontal; a middle segment, consisting of the basisphenoid, alisphenoids, squamosals and parietals; and a posterior segment, consisting of the basi-occipital, exoccipitals and supra-occipital. The exoccipitals bear the two condyles for articulation with the vertebral column. At the base of the skull, between the occipital and squamosal, are

MAMMALIAN TYPES



1 A Whale, Aquatic Type
2 Antelope, Terrestrial Type
3 Bat, Aerial Type
4 Ape, Arboreal Type

the periotic bones, containing the organ of hearing or internal ear, and the tympanics, which form the bony walls of the orifice of the ear. The tympanics are greatly expanded in whales and some other mammals, forming shell-shaped bullæ.

The vertebral column comprises five sections, the cervical, dorsal (or thoracic), lumbar, sacral and caudal. The cervical vertebræ are seven in number in all mammals, whatever the length of the neck, the only exceptions being the manatees, which have six, and the sloths, which have six, eight or nine. In certain whales, the majority of porpoises and some rodents, the cervicals are more or less united; in the right whales they form a single bony mass. The dorsals vary in number from 9 to 22. Articulated with each is a pair of ribs. The ribs terminate below in cartilages, which sometimes ossify, forming what are called "sternal ribs." By means of these cartilages the anterior pairs of ribs are connected with the breastbone or sternum, which may consist of a single piece, as in the whalebone whales, or of several segments arranged longitudinally. The posterior pairs of ribs are sometimes called "floating ribs" because their cartilages do not meet the sternum, but are attached to those of the more anterior pairs, or are quite free. The lumbar vertebræ follow the dorsals and are without ribs. In number they vary from 2 to 30 in different forms. The number of dorsal and lumbar vertebræ combined is quite constantly 23 in the odd-toed ungulates (horse, rhinoceros, tapir, etc.), 19 in even-toed ungulates (deer, ox, sheep, etc.), and 20 or 21 in carnivores and most insectivores. Man, the higher apes and many bats have 17. Following the lumbars is the sacrum, consisting usually of three vertebræ joined together and connected with the pelvis. This region is not distinguishable in the whales and sea-cows, which lack hind limbs. The caudals, or tail-vertebræ, complete the column. In man and in certain apes and bats they are three in number and rudimentary, but as many as 46 are present in the long-tailed pangolins. In the intervals between the anterior caudals below are situated small V-shaped bones, called chevrons, whose chief function is to protect the larger blood-vessels of the tail. They are especially well developed in the whales and edentates.

In many groups of mammals the anterior limbs are connected with the axial portion of the skeleton through the pectoral girdle, consisting of the shoulder blades, or scapulæ, and the collar-bones or clavicles. The scapula is not attached directly to the vertebral column, but its acromion process is joined to the anterior end of the breastbone, or sternum, by means of the clavicle. Clavicles are wanting in all seals, whales, sea-cows and ungulates, and are rudimentary or wanting in various representatives of several other groups. They are present in man and, with one or two exceptions, in all monkeys, bats, insectivores and marsupials. The upper-arm bone, or humerus, articulates superiorly with the scapula, and below with the two bones of the fore-arm, the radius and ulna. In the majority of mammals the radius, or outer bone, is permanently crossed over the ulna at the lower end, as is especially well seen in the elephants. In man and a few other forms the radius can be rotated. Following the fore-arm is the wrist or carpus, consisting of three rows of small bones, which, however, are variously united in different forms; and finally the digits, which are normally five in number, each consisting when fully developed of a metacarpal bone and three other bones, or occasionally more, called phalanges, though the first digit, or thumb, usually has but three in all. In man and apes the thumb is opposable to the other digits. In many mammals this digit and also the fifth are greatly reduced, or entirely wanting. In the ruminants, such as the pig, ox, deer, camel, etc., the first digit is wanting, and the second and fifth are reduced in size, or entirely lacking, while the third and fourth are equal in length and well developed. In the odd-toed ungulates, such as the horse, rhinoceros, tapir, etc., the third digit is longest, the others being reduced in length, rudimentary or wanting. In ungulates the metacarpals are usually much elongated and in such ruminants as the deer, ox, etc., are united, forming what is known as a "cannonbone." The cetacea are peculiar in that the bones of the fore-limb are not movably articulated and that the phalanges of the middle digits often greatly exceed three. In bats the phalanges are very greatly elongated to give support to the wing membranes.

The hind-limb is connected with the vertebral column through the pelvic girdle, which is united with the sacrum. The bones of the hind-limb, which are homologous to those of the fore-limb, are the femur or upper leg-bone, the tibia and the fibula or lower leg-bone, the tarsal or ankle bones and the metatarsals and phalanges constituting the hind-foot. The peculiarities of the bones of the fore-feet in ungulates, already mentioned, are found also, with only slight modifications, in the hind-feet.

The terminal phalanges of both fore and hind feet are compressed and pointed in beasts of prey and such as climb or dig, forming claws, which are covered with horny sheaths. In large running mammals, the terminal phalanges are more or less broad and flat and likewise covered with horny sheaths, forming hoofs or nails. Certain bones not connected with the skeleton, such as the *os penis, os cordis,* etc., are developed in the viscera of various mammals.

Teeth.— In mammals, unlike the lower vertebrates, teeth are not produced indefinitely, but in fixed number. At most two visible sets are developed. Traces are found, however, of at least one pre-milk and one post-permanent dentition. The first, called the milk dentition, appears during infancy, being replaced by the second set, called the permanent dentition, as maturity is reached. The milk teeth are less numerous and usually smaller than those of the permanent set. Teeth occur only in the premaxillary and maxillary bones and the mandibles or lower jaw. The upper teeth are divided into incisors, which are implanted in the premaxillæ; canines, which are almost invariably simple and stand immediately behind the suture between the premaxillæ and maxillæ; and premolas and molars, which occupy the edges of the maxillæ. The premolars have "milk" predecessors, while the molars have not. The nomenclature of the teeth of the lower

jaw is the same as for those of the upper jaw, their character being determined by their relation to the latter and by their form and mode of development. While the greatest diversity exists as to the form of the individual teeth, and the development of the dentition as a whole, there are rarely more than 44 in all. The exceptions are among the marsupials, where the number rises to 54 in the marsupial anteater, *Myrmecobius*, and to 64 in a fossil form *Amphitherium*; also among the cetacea, one species of which has as many as 246 simple teeth. The true anteaters, *Myrmecophagidæ*, and the spiny anteaters of Australia, *Echidna*, are without teeth at any time, but many mammals which do not possess them when adult have rudimentary teeth in the fœtal stages. Such is the case with the whalebone whales, and with the platypus, *Ornithorhynchus*. The rudimentary teeth in these disappear early and are replaced by whalebone in the case of the whales, and by horny plates resembling teeth in the platypus.

Teeth consists of two portions, the root and the crown. When most complex they contain three structural elements, the enamel, the dentine and the cement. The enamel is hardest and is restricted to the crown, while the dentine makes up the mass of the tooth, and the cement usually surrounds the root, or fills spaces between the enamel-folds of the crown. The enamel develops from the epithelial tissue of the jaws, the dentine from the deeper-lying areolar tissue and the cement from the walls of the tooth-capsule. Some teeth, such as the incisors of rodents, the tusks of the elephant, etc., grow continuously during life; other complete their growth early. Especially remarkable forms of teeth are the tusks of elephants, which are incisors, and the tusks of the narwhal, the boar and the babirussa, which are canines. When the crowns of the teeth greatly exceed the roots in height, as in the horse, the teeth are said to be hypsidont or hypselodont; when the reverse is the case, the teeth are called brachydont. Teeth having the crown in the form of tubercles, as in the hog, are called bunodont; those with transverse ridges, as in the ox, many rodents, etc., are called lophodont.

Alimentary Canal.—The mouth, or entrance to the alimentary canal, contains the tongue, which in the majority of mammals is so attached below that it can be protruded but a short distance, but is often sufficiently free to be used in grasping food and turning it about in the mouth during the process of mastication. In those mammals which feed upon ants and termites, such as the anteaters, pangolins, etc., and also in certain fruit-eating bats, the tongue is very long and slender and can be extended far beyond the mouth. On the posterior surface of the tongue are the organs of taste, and the upper surface is often roughened by horny papillæ. A number of large glands, called salivary glands, open into the mouth. Their function is to moisten the food and initiate the process of digestion. The glands most constantly present are the parotid, situated at the base of the ear, and opening inside the cheek, and the submaxillary, situated near the angle of the lower jaw, and opening under the apex of the tongue. At the back of the mouth is the entrance to the œsophagus or gullet, usually a simple tube, leading to the stomach. The stomach is an oblong, curved sac, usually enlarged at the cardiac end where the œsophagus is attached, and smaller at the lower, or pyloric, end, where it joins the intestines. It is usually simple, but in the ruminants and the cetaceans consists of several chambers. The intestines join the stomach at the pyloric end. They are usually of great length, and divided into two distinct sections. The portion nearest the stomach, called the small intestine, is joined below by one of larger diameter called the large intestine. The upper end of the latter is frequently dilated, forming a pouch called the cæcum, which in herbivorous mammals, and notably in rodents and many ungulates, is greatly enlarged or elongated. In man, the higher apes and the marsupial wombat it terminates in a narrow prolongation called the vermiform appendix. Different sections of the small intestine have received the names duodenum, jejunum and ileum; and of the large intestine, colon and rectum. The inferior orifice of the intestines is the anus or vent. Generally speaking, the intestines and cæcum are shortest in carnivorous mammals and longest in such as are vegetable feeders, but the carnivorous whales and seals, which have long intestines, form a conspicuous exception.

Besides the numerous glands situated within the intestine are two large ones, the liver and the pancreas, whose ducts open into the intestines near the stomach. The liver is a large, flat gland, which may be divided nearly into a right and a left lobe as in man, the cetacea and ruminants, or may have these lobes again subdivided into two by a longitudinal fissure. Two smaller lobes, called the Spigelian lobe and the caudate lobe, are commonly added. Attached to the liver is the gall-bladder, which is, however, absent in the cetacea and some other orders.

Kidneys.—The kidneys, whose function is to secrete urine, are situated in the upper part of the abdominal cavity near the vertebral column. They are two in number, oblong and usually simple, but in the cetacea, and also in bears and seals, are divided into separate lobules. A duct or ureter leads from each kidney to the urinary bladder, from which in turn a common duct, called the urethra, leads to the exterior of the body. In the monotremes, however, the ureters do not enter the bladder, but into a common urnogenital passage or cloaca.

Lungs.—The lungs are situated in the thorax, which is cut off below from the abdominal cavity by a muscular diaphragm whose action assists in the process of breathing. The lungs consist of two spongy lobes, a right and a left, which are free below, but attached above to the two principal divisions of the windpipe. In the cetacea and sea-cows, the lobes are simple externally, but in other orders are more or less subdivided. A third median lobe, called the azygos lobe, is present in some groups. Air breathed in through the nostrils reaches the lungs through the trachea or windpipe, the upper end of which, the larynx, lies in the throat. Its orifice, the glottis, is protected by a cartilage, called the epiglottis, which prevents particles of food from entering the windpipe. The larynx is made up of cartilages, of which the largest are the thyroid, the cricoid and the arytenoid. Within the larynx are the vocal cords, two parallel elastic, fibrous bands, whose

vibrations produce the voice. The lower end of the windpipe divides into two smaller tubes, or bronchii, each of which enters a lobe of the lungs and subdivides into numerous smaller branches. A third bronchius, which enters the right lung, occurs in some cetaceans and ruminants.

Heart.—The heart in mammals is four-chambered, consisting of two thin-walled auricles and two ventricles, both with thick walls, but the right, which supplies only the lungs, thinner than the left. There is no direct communication between the left and right sides of the heart after birth. The valve between the right auricle and the right ventricle is tendinous, except in the monotremes.

The aorta, or principal artery, bends toward the left immediately beyond its connection with the heart and gives off the innominate, left common carotid, and subclavian arteries, which, with their branches, supply the head and anterior limbs. The method of branching of these arteries from the aortic arch and from one another varies widely. Blood is carried from the alimentary canal to the liver by a single vein, except in Echidna, in which as in lower vertebrates the abdominal vein is present. The kidneys are supplied with blood only by the renal arteries.

Brain.—Except for certain fossil forms, the brain of mammals is characterized by its relatively larger size as compared with that of lower vertebrates, and especially by the magnitude of the cerebral hemispheres and the perfection of the connections between them. In most mammals the surface of the brain is divided by numerous irregular fissures and convolutions. They are absent only in small bats, rodents and insectivores, and in *Ornithorhynchus*. The largest forms in each order, generally speaking, exhibit the greatest complexity, and there has been a remarkable development in the class in this direction since Tertiary times. The cetacea have very large and complex brains, though they are small relatively, when compared with the size of the body.

Sense Organs.—The organs of sense, except that of touch, are located in the head. The sense of touch is generally distributed over the skin, but is most acute in the snout, and in the extremities, except when used merely in locomotion. The wings of bats and the prehensile tails of monkeys are also especially sensitive. Some burrowing mammals, such as the mole, have imperfect eyes, the optic nerve being more or less atrophied. The Indian river-dolphin, *Platanista*, is a blind form, having rudimentary eyes, without crystalline lenses. The mammalian ear is characterized, besides the chain of ossicles, already mentioned, by the complex cochlea, which is usually spirally convoluted. The tympanic membrane, or eardrum, seals the auditory chamber from without. In the majority of mammals the external orifice of the ear is surrounded by a fold of skin, called the pinna or external ear. These are absent in cetaceans, sea-cows, seals, etc., which live in the water, and also in some burrowing mammals.

Reproductive System.—In mammals the female reproductive organs comprise the ovaries, Fallopian tubes or oviducts, uterus and vagina. The ovaries are two in number, a left and a right. Approximated to them are the Fallopian tubes, which widen below and form the uterus. In the lower mammals the uterus of each side is separate, but the two unite below in a common vagina, while in the higher groups, the uterus and vagina are both single. The male organs comprise the testes, spermatic cord and penis. In cetaceans, sea-cows and seals, which are aquatic, and in the elephants, conies and many edentates, the testes are internal in position, but in most other forms they descend periodically, or permanently, into a pouch of the integument, called the scrotum. The structure of the penis in mammals is peculiar to the class. An *os penis* is present in the majority of bats, insectivores, rodents, carnivores and primates.

During development the mammalian fœtus is nourished through a complex structure, called the placenta, formed in part by the internal wall of the uterus of the mother and in part by the membranes of the fœtus itself. The placenta is characteristic of the class as a whole, but is not found in the monotremes, nor in most marsupials. The form and other characteristics of the placenta differ in the several orders of mammals and are regarded as of importance in classification.

Distribution.—The geographical distribution of existing mammals, as of other animals, is the result of varied conditions and influences, some transient and others of long continuance, beginning in the relatively remote geological times when the class first made its appearance. Among the principal factors in the problem of distribution may be included changes in the extent and configuration of the land areas of the globe, changes in climate and in food supply, the appearance and disappearance of enemies, and latest, but by no means least, the interference of man. These and other factors in distribution are considered under the heading DISTRIBUTION OF LIVING MAMMALS. It is only possible here to mention some of the more important facts in the distribution of mammals. Of widest distribution are the purely aquatic orders, the cetacea and pinnipedia, whose range covers all seas and reaches from pole to pole, but it should be noted that no sea-lions occur in the north Atlantic. Next follow the bats, whose range is nearly world-wide, but they do not enter the Antarctic zone, and only very few species cross the Arctic Circle. On the other hand, they are found in New Zealand and in oceanic islands where no terrestrial indigenous mammals occur. Of the purely terrestrial orders, the rodents have the widest range, covering every continent and reaching from the Arctic zone to Patagonia and Tasmania. Carnivores, like rodents, have an almost world-wide distribution, but in Australia only one species of the order occurs, the dog known as the "dingo," *Canis dingo;* and it is uncertain whether this may not have been introduced by man at a remote date. The monotremes (comprising only the genera *Ornithorynchus, Echidna* and *Proëchidna*) are limited to Australia, Tasmania and New Guinea. Marsupials occur only in Australia, Tasmania, New Guinea and America. The American marsupials, with the exception of one genus, all belong to the family *Didelphiidæ*, or the opossums. Edentates occur only in America, southern Asia and Africa. They have their greatest development in South America. One genus, *Tatu*, extends northward

into Texas. Ungulates inhabit all continents except Australia, but only two or three species enter South America. Of the two groups forming the order *Primates*, the lemurs and lemuroids occur only in Madagascar, Africa and southern Asia, while monkeys inhabit only Africa, southern Asia and South and Central America. One ape, *Macacus inuus*, is found at Gibraltar, but it is only doubtfully indigenous.

Fossil Mammals.— Mammals are believed to have originated as an offshoot from certain Permian and Triassic reptiles called *Theromorpha* or *Anomodontia*. The earliest recognizable remains of mammals are certain small teeth and jaw-bones found in the Triassic formations. They belonged to forms resembling monotremes and marsupials in some characters, but are usually placed in a separate order, called *Allotheria* or *Multituberculata*. Representatives of the *Allotheria* continued on through the Jurassic and Cretaceous. The existing orders of mammals first appear in the Eocene, the lowest formation of the Tertiary period, being foreshadowed in the lowest beds of that period by certain generalized groups such as the *Creodonta* and *Condylarthra*. The Eocene also contains remains of several groups, or suborders, of ungulate mammals, which have no living representatives. These are the *Ancylopoda, Typotheria* and *Toxodontia*.

The later Tertiary and the Quaternary periods show a greatly increased number and diversity of forms. Many of them represent families which persisted for only a relatively short period and are now extinct; others have continued to the present. Among the oldest of existing genera are *Didelphis* (opossum), *Sciurus* (squirrel), *Myoxus* (dormouse), *Sorex* (shrew), *Vespertilio* and *Vesperugo* (bat) and *Viverra* (civet), which originated in the Eocene; *Tapirus* (tapir), *Rhinoceros, Giraffa* (giraffe), *Elephas* (elephant), *Sus* (pig), *Talpa* (mole), *Erinaceus* (hedgehog), *Mustela* (marten), *Lutra* (otter), *Hyæna, Felis* (cat) and *Phoca* (seal), which originated in the Miocene.

Classification. - The class *Mammalia* was divided by Linnæus into three principal sections, *Unguiculata, Ungulata* and *Mutica*. The last comprises the cetaceans, the second all the ungulates except the elephant, and the first, the remainder of the class. This classification was replaced by Blainville, who proposed on embryological grounds to divide the class into *Monodelphia*, or mammals with a placenta; *Didelphia*, or mammals without a placenta (the marsupials) and *Ornithodelphia*, or the monotremes. Richard Owen combined the last two subclasses under the name of *Eplacentalia* and gave the placental mammals the name of *Placentalia*. Speculation as to the origin of the class as a whole led Huxley to propose as the source a hypothetical group which he named *Hypotheria*, the characters assigned being the absence of milk glands and of a corpus callosum in the brain and the presence of a quadrate bone for the articulation of the mandible. Existing mammals were divided into *Prototheria*, comprising the monotremes, *Metatheria*, the marsupials, and *Eutheria*, the so-called placental mammals. Cope in 1889, while retaining the subclass *Prototheria* for the monotremes, placed the entire remainder of the class in the subclass *Eutheria*. Flower and Lydekker (1891) adopt Huxley's divisions, while Beddard (1902) makes use of those of Cope. Flower and Lydekker's arrangement of families and higher groups is as follows (fossil groups printed in italics):

Subclass 1. PROTOTHERIA.
- Order 1. Monotremata (Monotremes).
  - Families: Ornithorhynchidæ, Echidnidæ.
- (Group, *Multituberculata* or *Allotheria*.
  - Families: *Plagiaulacidæ, Polymastodontidæ, Tritylodontidæ*).

Subclass 2. METATHERIA.
- Order 2. Marsupilia (Marsupials).
  - Suborder 1. Polyprotodontia.
    - Families: *Dromatheriidæ, Amphitheriidæ, Spalacotheriidæ*, Didelphyidæ, Dasyuridæ, Peramelidæ.
  - Suborder 2. Diprotodontia.
    - Families: Phascolomyidæ, Phalangeridæ, *Diprotodontidæ, Nototheriidæ*, Macropodidæ.

Subclass 3. EUTHERIA.
- Order 3. Edentata (Edentates).
  - Families: Bradypodidæ, *Megatheriidæ*, Myrmecophagidæ, Dasypodidæ, *Glyptodontidæ*, Manidæ, Orycteropodidæ.
- Order 4. Sirenia (Sea-cows).
  - Families: Manatidæ, *Rhytinidæ*, Halicoridæ, *Halitheriidæ*.
- Order 5. Cetacea (Cetaceans).
  - Suborder 1. Mystacoceti (Whalebone whales).
    - Family: Balænidæ.
  - Suborder 2. *Archæoceti*.
    - Family: *Zeuglodontidæ*.
  - Suborder 3. Odontoceti (Toothed whales).
    - Families: Physeteridæ, Plaatanistidæ, Delphinidæ.
- Order 6. Ungulata (Hoofed mammals).
  - Suborder 1. Artiodactyla (Even-toed ungulates).
    - Families: Hippopotamidæ, Suidæ, *Chæropotamidæ, Anthracotheriidæ, Merycopotamidæ, Cotylopidæ, Anoplotheriidæ, Dichodontidæ*, Tragulidæ, Camelidæ, *Poebrotheriidæ*, Cervidæ, Giraffidæ, Antilocapridæ, Bovidæ.
  - Suborder 2. Perissodactyla (Odd-toed ungulates).
    - Families: Tapiridæ, *Lophiodontidæ, Palæotheriidæ*, Equidæ, Rhinocerotidæ, *Lambdotheriidæ, Chalicotheriidæ, Titanotheriidæ, Macraucheniidæ*.
  - Suborder 3. *Toxodontia*.
    - Families: *Toxodontidæ, Typotheriidæ*.
  - Suborder 4. *Condylarthra*.
    - Families: *Periptychidæ, Phenacodontidæ, Meniscotheriidæ*.
  - Suborder 5. Hyracoidea (Conies).
    - Family: Hyracidæ.
  - Suborder 6. *Amblypoda*.
    - Families: *Pantolambdidæ, Coryphodontidæ, Uintatheriidæ*.
  - Suborder 7. Proboscidea (Elephants).
    - Families: *Dinotheriidæ*, Elephantidæ.
  - (Group *Tillodontia*).
    - Families: *Anchippodontidæ, Calamodontidæ*).
- Order 7. Rodentia (Rodents).
  - Suborder 1. Simplicidentata.
    - Families: Anomaluridæ, Sciuridæ, Haplodotidæ. *Ischyromyidæ*, Castoridæ, Myoxidæ, Lophiomyidæ, Muridæ, Spa-

lacidæ, Geomyidæ, Dipodidæ, *Theridomyidæ*, Octodontidæ, *Castoroididæ*, Hystricidæ, Chinchillidæ, Dinomydæ, Caviidæ, Dasyproctidæ.
Suborder 2. Duplicidentata.
Families: Lagomyidæ, Leporidæ.
Order 8. Carnivora (Carnivores).
Suborder 1. Carnivora vera (Fissipeds).
Families: Felidæ, Hyænidæ, Protelidæ, Viverridæ, Canidæ, Ursidæ, Mustelidæ, Procyonidæ.
Suborder 2. Pinnipedia (Pinnipeds).
Families: Otariidæ, Trichechidæ, Phocidæ.
Suborder 3. *Creodontia.*
Families: *Hyænodontidæ, Proviverridæ, Arctocynidæ, Mesonychidæ.*
Order 9. Insectivora (Insectivores).
Suborder 1. Insectivora vera.
Families: Tupaiidæ, Macroscelididæ, Erinaceidæ, Soricidæ, Talpidæ, Potamogalidæ, Solenodotidæ, Centetidæ, Chrysochloridæ.
Suborder 2. Dermoptera.
Family: Galeopithecidæ.
Order 10. Chiroptera (Bats).
Suborder 1. Megachiroptera.
Family: Pteropidæ.
Suborder 2. Microchiroptera.
Families: Vespertilionidæ, Nycteridæ, Rhinolophidæ, Emballonuridæ, Phyllostomatidæ.
Order 11. Primates.
Suborder 1. Lemuroidea (Lemurs and Lemuroids).
Families: *Hyopsodontidæ,* Chiromyidæ, Tarsiidæ, Lemuridæ.
Suborder 2. Anthropoidea (Monkeys and Man).
Families: Hapalidæ, Cebidæ, Cercopithecidæ, Simiidæ, Hominidæ.

The groups of existing mammals whose structural peculiarities are such as to entitle them to rank as separate families vary greatly as regards the number of genera and species they comprise, some being represented by a multitude of different forms, while others consist only of a single species, or a single genus with but a few species. Families consisting of only a single genus and species are as follows: The Chiromyidæ, established for the reception of the Aye-Aye, a singularly modified lemuroid mammal, confined to Madagascar; the Dinomyidæ, comprising only a large Peruvian rodent, somewhat like a paca, of which a single specimen is known; the Antilocapridæ, represented only by the Prong-horn of the western plains of North America; the Notoryctidæ, comprising only a small mole-like marsupial recently discovered in South Australia; the Ornithorhynchidæ, comprising only the Platypus, or Duck-bill, of Australia. These and other restricted families are to be looked upon as fragments of groups of genera and species, of which the greater number are extinct, or as branches from main lines of development which have never progressed and ramified.

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MAMMARY GLANDS, the milk-glands of mammalian animals (see BREAST). They are present in all mammals, in both sexes, but in the male are usually rudimentary, their functional activity being limited to the female, who secretes in these glands the milk for nourishing her young during a natural period after birth. In all mammals they are placed in pairs, but vary much in position and number in different groups. Zoologists give them names according to their position near the armpits (axillary), on the chest (pectoral), on the belly (ventral or abdominal), or near the groin (inguinal). They are never situated on the back. The number in an individual may be from 2 to 12 or more, and is usually even. The structure of the cow's udder is due to the uniting of the same number of mammæ as there are of teats, the number of which, when more than two, usually corresponds to that of the young produced at each birth. The mammary glands of Marsupialia (q.v.) are contained in the pouch. In monotremes — duck-bills and echidnas — the nipple is not present. (See PROTOTHERIA).

Diseases of the Mammary Glands.— The common inflammation of the glands (mastitis) is often attended by much swelling, with fever and painful tenderness. The formation of pus is apt to result in a slowly pointing abscess. Great care in diet and regulation of the bowels should be observed. Purgatives and fomentations may be necessary, also in many cases the placing of the arm on the affected side in a sling. Drawing off the milk and evacuating the pus may be practicable and will afford great relief. Pain in the breasts (mastolynia) may result from many causes, of which sore nipples is one of the most frequent. The nipples are also subject to cracks, ulcerations, etc., which occasion much difficulty and pain to the mother when suckling the child. Lotions of an astringent character, as tannin, etc., have a remedial effect in such disorders, as have also collodion and lunar caustic (nitrate of silver), when applied to the sore nipple. Metallic shields are used in severe cases for protection of the affected point. Among many specific disorders to which the mammary glands are liable are cancer and galactocele and other forms of tumor. See MILK FEVER.

MAMMEE APPLE, or SOUTH AMERICAN APRICOT, the fruit of a clusiaceous tree, bearing white, showy, fragant flowers, growing naturally in tropical America, but largely cultivated in tropical parts of the Old World. The fruit is several inches in diameter, with a double rind and a yellowish pulp like that of an apricot, which is sweet and nourishing and is eaten raw or with wine and sugar or is boiled. A spirituous liquor called Eau Créole is distilled from its flowers; and the gum exuding from the bark is used by the Central Americans for destroying chigoes in the feet. This gum-resin is similar to the «gamboge» derived from a closely related West African tree (*Garcinia hamburyi*).

MAMMON, a term popularly held to be a mere personification of riches. It is used in

Matt. vi, 24 and Luke xvi, 9. Milton makes Mammon a fallen angel of sordid character.

MAMMOTH, an elephant (*Elephas primigenius*) which inhabited the temperate parts of the northern world during the Glacial period, and at its close spread northward with the retreat of the ice, and survived until the Neolithic period of human history. Some account of the origin and probable wanderings of the species is given in the paragraph relating to fossil elephants under ELEPHANT. Mammoth remains have been found in intimate association with the handiwork of savage man; and upon a piece of bone a portrait of this animal was found scratched, the accuracy of which shows a close acquaintance by the Cave-dwellers of France with the animal in life, and much artistic skill. This elephant, although the word "mammoth" has become an expression for hugeness, was little if any larger, on the average, than the modern Asiatic elephant, to which it was nearly related. Its remains are abundant and enable us to reconstruct its form and features completely, especially since the remarkable discovery, first in 1799, of carcasses frozen into the icy cliffs along the Arctic coast of Siberia. One of the most important discoveries of this kind occurred in 1801. Since the earliest known times ivory from buried tusks of these animals has been obtained from northern Siberia and Alaska, and many curious stories were invented to account for its origin, especially among the Chinese, who had never seen an elephant; but the specimens above mentioned contained not only the tusks still in their sockets and every bone in its place throughout the skeleton, but a great part of the flesh was in a condition fit for sledge-dogs to eat and enjoy, and was covered with thick skin still clothed with long dark hair, beneath which was a dense woolly fur, well fitted to protect the animal against arctic cold. The ears were much smaller than those of modern elephants. This specimen of 1801, which is preserved in the Royal Museum at Saint Petersburg in the attitude in which it was found buried, measured 16 feet 4 inches from the forehead to the extremity of the tail; its height was 9 feet 4 inches, and the tusks, along the outer or greater curve, measured 9 feet 6 inches. Of other well-known specimens, that skeleton mounted in Chicago is one of the largest known, and its tusks measure 9 feet 8 inches. The largest tusks on record are a pair found in Alaska which measure 12¾ feet in length. All mammoth tusks show an outward and upward sweep very distinct from the growth of elephant tusks. The mammoth seems to have been extremely numerous all over northern Europe, Asia and North America, especially during post-glacial times, when northern Asia was covered with pine forests to the borders of the Arctic Sea, affording plentiful food in their leaves and twigs upon which these animals browsed. The disappearance of these forests, due to slow climatic changes, is supposed to be the principal influence which led to the extermination of the species, a fact otherwise not easily to be explained. It is probable that human hunting had much to do with the mammoth's final disappearance. (See also ELEPHANTS; FOSSIL). Consult Beddard, F. E., 'Mammalia' (New York 1902); Lucas, F. A., 'Animals of the Past' (ib. 1901); Scott, W. B., 'History of Land Mammals in the Western Hemisphere' (ib. 1913); Herz, O. F., 'Frozen Mammoth of Siberia' (Washington 1904). See MASTODON.

MAMMOTH CAVE, Ky., a remarkable American cavern, in Edmondson County, 83 miles southwest of Louisville, reached by a small branch line connecting at Glasgow Junction with the Louisville and Nashville Railroad. Its areal diameter is about 10 miles, and about 100 miles of passageway have been explored, including avenues, chambers, pits, domes and rivers. What is termed the Main Cave is three miles long, varying in width from 40 to 175 feet and in height from 40 to 125 feet. Its greatest enlargement is known as the Chief City (or Temple), an oval room 541 feet long, 287 feet wide and 125 feet high; anciently a rendezvous of the Indians, whose torches and other relics have been found in abundance. The Star Chamber mimics the starry heavens by reason of its lofty ceiling of black oxide of manganese flecked by snowy crystals of gypsum. The cavern exists in five successive tiers, through which, at various points, shafts have been cut, which are styled pits or domes, according to the point of view. The largest are the Bottomless Pit, Gorin's Dome, the Mammoth Dome and the Maelstrom, and their average depth is about 100 feet. Oval depressions, locally known as "sink-holes," drain through the pits and chasms and form subterranean lakes and rivers; which finally find an outlet to the neighboring Green River. The largest, the Echo River, gets its name from the wonderful reverberations of sound along its course. Boats are provided for short voyages. Eyeless fish abound, of which there are three or four species; besides, blind crawfish, blind crickets, flies, beetles and spiders and other abnormal fauna are found on the walls and under the rocks. The structure and habits of these animals have been studied with great care.

Beyond River Hall long avenues extend, many adorned by marvelous gypsum rosettes and brilliant arches of crystal efflorescence in the most fantastic diversity. Cleveland's Cabinet is frequently mentioned as a treasure-house of cave flowers, but some of the smaller rooms, for instance, Charlotte's Grotto, can boast of finer displays. The great cavern is said to end at Croghan's Hall, where is the Maelstrom already mentioned, but the few who have dared go to the bottom of this profound abyss report wide and long avenues beyond, which are yet to be explored. Everywhere, even in the deepest pits, the atmosphere is both chemically and optically pure; the temperature is uniformly about 54° F. all the year around, as has been determined by a long series of exact scientific observations, in order to discover the temperature of the crust of the earth.

The discovery of the Mammoth Cave is usually credited to a hunter named Hutchins, in 1809; but the present manager of the estate finds that the county records, in 1797, fix the entrance to this cavern as a landmark for a piece of real estate. The locality first gained notoriety by reason of its immense deposits of saltpeter, which were used in the manufacture of gunpowder during the War of 1812. After passing through the hands of several owners, the cave was bought by Dr. John Croghan, who

willed it to his nephews and nieces, with instructions that at their death it should be sold at auction. An earnest wish has been expressed by many that the famous cavern should eventually become a State or national park. See also CAVE; CAVE ANIMALS.

MAMMOTH HOT SPRINGS. See YELLOWSTONE NATIONAL PARK.

MAMO, a bird (*Drepanis pacifica*) of the Hawaiian Islands, related to the creepers, and now nearly extinct because of the great demand in past years for their yellow feathers for making the feather-cloaks formerly worn as insignia of royalty by the chiefs. Other birds supplied certain other required feathers. Very few of these cloaks remain in museums.

MAMORÉ, mä-mō-rā′, a river of Bolivia which has its rise in the Cordillera Real, near Sucre, and flows first east by south, then forms almost a semi-circle toward the north to Trinidad, from where its course is nearly north to where it unites with the Beni and forms the Madeira River. In the first part of its course it is called Rio Grande. The Mamoré is about 1,300 miles long and navigable for about 1,000 miles, with some obstructions. About 40 miles above its junction with the Beni are the Guajara Falls, above which navigation is free for about 400 miles to places where fallen logs have filled in between the banks and formed dams.

MAMPALON, an aquatic animal (*Cynogale bennetti*) of Borneo, of the civet family. It is otter-like in form, is about 18 inches long, has stout webbed plantigrade feet and is thoroughly adapted to an aquatic life while retaining purely viverrine characteristics of structure.

MAN. See ANTHROPOLOGY; APE; ARCHÆOLOGY; ETHNOLOGY; PRIMATES.

MAN, Christian Anthropology. The thorough discussion of the theory of evolution for the past two generations has served to make it clear just what contributions to the problems of man's origin and place in the universe have been made by modern science. For a time it was felt that the whole mystery of man's existence was to be solved. It is now recognized that in spite of our great advance in knowledge, to use Bryce's expression the "mists that hang around man's origin and man's destiny are so far as scientific knowledge goes just as deep as ever." Only those who fail to appreciate that science does not solve mysteries, but multiplies them, are of the opinion that biology, notwithstanding all its contributions to our knowledge of man, has furnished the key to the problems of anthropology. More now than ever those who know our modern science feel that for any reasonably adequate understanding of man's nature and place in the universe a reference to the records of man's religious experience must be made. The time for the synthesis of Christian and scientific views with regard to man has come to them, not with the purpose of reconciliation, for no reconciliation is needed, but for a proper understanding of the philosophy of life that lies behind both science and faith.

The enthusiastic reception which always greets a novelty in thought even in the serious domain of science led many to exaggerate the significance of the theory of evolution (q.v.) through natural selection which came to occupy so much attention in the biology of the second half of the 19th century. As a result a widespread impression prevailed that evolution had accounted so completely for the origin of all living beings from the lowest to the highest as they exist around us that the idea of creation and a Creator was no longer tenable. The closing words of Darwin's 'Origin of Species' makes it very clear that the great English scientist himself had not, as a result of his elaboration of the theory of natural selection as an explanation for evolution, given up his belief in creation or the Creator nor felt that his scientific work had any tendency to produce disbelief in religious traditions in this matter. He said: "There is grandeur in this view of life with its several powers having been originally breathed by the Creator into a few forms or into one; and that, while this planet has gone circling on according to the fixed law of gravity, from so simple a beginning, endless forms most beautiful and most wonderful have been and are being evolved."

What Darwin thus brought to be the basic thinking of scientists in the latter half of the 19th century was the theory of descent or derivative creation, that is, creation of one or more simple forms of life to which were given the power of developing with the production of higher forms. This teaching of derivative creation is not modern in origin, but on the contrary very old. Christian philosophers from the earliest times formulated opinions clearly expressive of this view. Saint Augustine suggested that the original creation was of *semina rerum,* "the seeds of things." These seeds once brought into existence went on developing until the universe of living things which we see around us came into existence. This teaching of Saint Augustine became the Christian tradition down the centuries. Saint Thomas Aquinas (13th century), whose writings by the special direction of the Pope are the accepted authority in the Catholic theological schools of the world to-day, was a close disciple of Saint Augustine in this as in most other questions. Cornelius á Lapide (1567–1637), looked up to as an authority scarcely less than Saint Thomas on biblical matters, followed Augustine's teaching. When St. George Mivart not long after the publication of Darwin's 'Origin of Species' pointed out in his 'Genesis of Species' that Suarez, the great Spanish theologian, taught this doctrine of derivative creation, it made quite a sensation among those who had been inclined to think of certain narrow literal interpretations of Scriptural expressions as the constant Church tradition. The sensation subsided, however, when it came to be recognized that this teaching of Suarez far from being exceptional represented the most conservative Christian opinions since the time of the Fathers. Suarez actually wrote "a separate section of his metaphysics in opposition to those who maintained the distinct creation of the various kinds — or substantial forms — of organic life." (Mivart). The crude anthropomorphic notion which had gained popular credence, that the Creator had as it were fashioned each of the species directly out of earthly materials, had not been accepted by earlier philosophic thinkers. So far as it came to be the belief of those who gave any attention to the subject, it was a late gloss on the Scriptural account of creation

founded on the narrower views which became common only after Luther's movement made the literal interpretation of the Bible the sole rule of faith.

Only the knowledge of the genuine Christian tradition in the matter was needed to dispel the idea of any incompatibility betwen the theory of evolution in the true scientific sense of the term and creation. It is just as much creation, if but a single form of life were evoked from nothing, the great law of evolution being impressed upon it so that it gradually grew more complex until the whole series of living beings that we see around us came into existence, as if each being were created by a special act. The creation of species would under that explanation be the granting of power to any particular form of life to lift itself above what it was by inheritance from its progenitors. The special creation of man would then be the gradual formation of his body from the earth through a long series of ever-developing living beings until the organism had reached a stage of development capable of providing the mechanism suitable for a rational soul to act in association with matter. Only when this living matter had become suitable for co-ordinate activities with man's spirit was the rational soul breathed into the body, which by this inspiration was made like to its Creator.

The Scriptural description of Creation is summed up in the words "Let the *earth bring forth* each living creature in its kind, cattle and creeping things, and beasts of the earth according to their kind, and it was so done." . . . "And He said let us make man to our own image and let him have dominion over the fishes of the seas and the fowls of the air and the beasts and the whole earth and every creeping creature that moveth upon the earth."

"And God created man to His own image."

It is the rational spirit of man that is Divine and there is no good reason to forbid the thought that God may have created the body to receive that spirit by a long succession of evolutionary steps. To many there would seem to be more reverence in that idea than if God took red earth (Adam, in Hebrew) and fashioned the body directly and then breathed the spirit into it. Wasmann in his 'Modern Biology and the Theory of Evolution' reminded us that the taunt that orthodox believers imagined the God of the Bible as a sort of potter in human form fashioning for Adam a body of clay was utterly unjustified by any real knowledge of Christian tradition. Saint Augustine described any such imagination as *nimium puerilis cogitatio* — "entirely too puerile for consideration."

Newman called attention to the Scriptural expression in Genesis (ii, 7): "The Lord God formed man of the dust of the ground and breathed into his nostrils the breath of life and man *became* a living soul," and comments: "Here are two acts on the part of the Creator — the forming the dust, and the breathing the life. . . . Man was made rational *after* he was made corporeal."

Wasmann said, quoting Saint Augustine once more, that "It would seem more fitting to believe that in producing the first man as in producing all other creatures, God employed natural causes as far as they were capable of cooperating toward this aim." Wasmann continues, "We must, therefore, admit that it would be possible for anyone to account for the origin of the human body by assuming God to have created a primitive cell and to say that the earliest ancestors of man were organisms living as simple cells; later on as the organs were differentiated and the nervous system was formed and a sensitive soul came into existence they developed into animals. The organism gradually increased in perfection and as the brain developed this soul in course of time prepared a human body suited to be the dwelling of a rational soul and, through possessing highly developed brain cells, able to satisfy the conditions of spiritual activity and its verbal expression. Assuming this theory to be true we may still say that man certainly only became man at the moment of the creation of his rational soul." He adds that "any objection to this theory (on the score of lack of dignity in the procedure) may be met by a reminder that man's body even now is produced by germinal development from a fertilized ovum."

The question as to whether man's body came by such a process of evolution through the animals still remains open. It is now confessed by scientists to be quite absurd to suggest that man is descended from the monkey, and Klaatsch went so far as to say that man is not descended from the monkey because the monkey is degenerate man. The generally accepted idea is that both the monkey and man came from a remote ancestor, one branch of whose progeny continued an upward course in the direction of the human body, while the other degenerated into that of the monkey. This is, however, entirely theory. There is no evidence for it and though Zittel gives no fewer than 30 genera of fossil pro-simæ and 18 genera of fossil apes not one connecting link has been found between their hypothetical and ancestral form and man of the present time. "The whole hypothetical pedigree of man is not supported by a single fossil genus or a single fossil species." (Wasmann). The *pithecanthropus erectus* or so-called Trinil man of Java has all of his scientific relationship to man in the word anthropus, the name forced upon him at the beginning, for he does not belong to the pedigree of modern man, but to that of the modern apes.

A great many people in our time are of the impression that it was not until the serious discussion of the theory of evolution came up that man's intimate relations to the animals was recognized. It has been the teaching of Christian philosophers from the very beginning that man is an animal, and the definition for man adopted from the Greeks by all Christian writers was that he is a rational animal. As to where his body came from Christians are manifestly free to believe — if they think there is evidence for it — that the animality of man is the result of a process of evolution by which in the course of biogenesis the human body developed through the animals and then was raised by special creation to the highest species by the introduction of a soul. Those who argue that there is no need for this special creation of man are as a rule scientists whose interests have been largely centred on man's relationship to the animals rather than on his superiority to them. The zoologist, intent on the

morphology of the human body and its intimate relation to animal bodies, easily minimizes the extremely great difference that his mind confers upon man. Zoologists have suggested that man may be defined as "a tool making and tool using animal." If that were all that man really is, then there would be no need for the special creation of a soul. Man looked on as merely a higher animal is "a tool-making, tool-using animal," but as a rational animal, man is a thought-creating being, and this places an immense gap between him and the other animals. There can be no question of any process of evolution from the animal accounting for the being which produced the 'Iliad,' or the 'Divine Comedy,' or Shakespeare's 'Hamlet,' or created Hagia Sophia or Saint Peter's, or painted the Sistine Madonna. To comprehend their origin we recur to the introduction of some great new force from without. The necessity for a definite series of renewed impulses putting new powers of development into living beings becomes clearer the more biology is studied. That evolution could have occurred by a series of very slight changes for which chance might be appealed to has now been definitely given up. Such genesis of species as science has been able to trace has come by rather large jumps for which there is no sufficient cause in the conditions of preceding life. Manifestly some new force has been introduced into nature and it cannot be thought seeing the results that this occurred without design. As we shall see teleology or the place of design in the world has come back into biology with renewed force in recent years.

Many seem to think that the more careful study of the significance of natural selection in the world of life had entirely done away with any necessity for an appeal to forces outside of nature to account for evolution. Any such thought, however, is due to failure to recognize the real place of natural selection as a factor in evolution and to hand over natural processes to the influence of chance. Almost needless to say chance is only a word used to indicate our lack of knowledge of the factors at work in any problem. Creative direction was the phrase that Lord Kelvin preferred to use as descriptive of the forces at work bringing about whatever development there is in nature. Darwin himself did not believe that natural selection did away with the necessity for creation and expressed himself to this effect in the last sentence of his book. He realized very clearly that though his book was called the 'Origin of Species' it did not discuss origins, but, on the contrary, preservations. He would have preferred to call it by its secondary title 'The Preservation of Favored Races in the Struggle for Life.'

The exaggeration of the significance of the phrase "struggle for life" led many to the belief that this process of struggle did away with the idea of an over-ruling Providence, and particularly of any fostering relationship on the part of a Supreme Being. In this once more as in so many other departments of evolution the Darwinians, so-called, went ever so much farther than Darwin himself, who recognized very clearly and emphasized the fact that the struggle for life did not mean any personal conflict between animals to the death, but on the contrary such reaction of vital forces to the environment in which the animal was placed has brought out all its powers and gave it a higher vitality than it would otherwise have had. As Huxley said, "Life is a game infinitely more complicated than chess and the player on the other side is hidden from us." "We know that his plays are always fair, just and patient. To the man who plays well the highest stakes are paid with that sort of overflowing generosity with which the strong shows delight in strength." This is a much better picture of the struggle for life than many of those given by the Darwinians and even by Huxley himself when he was in ultra-Darwinian mood.

Biological developments have served to minimize the place of the struggle for life and to emphasize mutual aid as a factor in the process of evolution. While the idea of the struggle for life dominated biology it seemed to many as though evolution had been handed over to blind forces, largely composed of strength and the advantage which might gave to the stronger animal. An exaggeration of the significance of the struggle for life against which Darwin had warned, but which was taken up by the Darwinians as representing the most important chapter in biology, made a great many people believe that the law of nature was that the stronger survived and that the weakest must go to the wall; that nature had no care for the individual, but only for the race, and that life was just a huge gory spectacle of death inflicted on living things by other living beings that happened to have secured the advantage over them. Even Huxley, usually so careful, was carried away by this view and in his essay on "The Struggle for Existence in Its Bearing upon Man," suggested that "From the point of view of the moralist the animal world is about on the same level as a gladiator's show. The creatures are fairly well treated and set to fight; the strongest, the swiftest and the cunningest live to fight another day. The spectator has no need to turn his thumb down as no quarter is given."

Russian biologists, in the face of the immense difficulties for living things provided by the severe climate of their country, came to recognize early that it was not the individual of greatest strength that always survived, but that nature provided a great law of helpfulness among the animals. They called attention then to the principle of mutual aid as of probably more importance than the struggle for life as a factor in evolution and it has now come to be recognized that practically all living things have instincts of mutual aid that are extremely precious for them. The smallest living beings, the insects, frankly live community lives for mutual protection, not only against enemies but against the vicissitudes of climate and for the conservation of food. The smaller mammals often live in villages, so-called, or groups that prove distinctly helpful. Even the larger mammals possess the same precious instinct, and wild horses herd together for protection against packs of wolves which hunt together because thus they are able to overcome even the very large animals. A drove of wild horses, when attacked by a pack of wolves, gather in a circle, heads toward the centre,

leaving a space on the inside for the foals and presenting on the outside to their enemies only a battery of heels.

Cows herd together and practically all the ungulates and even such huge beasts as the elephants protect the young by traveling in groups sometimes containing as many as 20. When attacked by one of the big cats, the lions and the tigers, which find baby elephants particularly a toothsome morsel, the old bull elephants on the outside of the herd prove finely capable of affording protection. Far from competition within the species being the law of biology, mutual aid is a deeper instinct in most cases, and very rarely does it happen that animals of the same kind struggle with each other for sustenance, except in cases of famine or when a mother under difficulties is seeking food for her young. Under these conditions the moral law does not bind among men, though the exceptions only prove the rule of the existence of law, and among animals these rather striking exceptions prove that there is a law or instinct of mutual aid by which the animals help each other very materially.

Two things are necessary for the preservation of species. One is food provision and the other is propagation of the race. Food provision under certain circumstances may necessitate the struggle for existence, but the propagation of the race involving as it does the existence of small weak animals necessitates a law of mutual aid and such is actually found to exist. The overemphasis on food provision and the failure to appreciate at their true value the conditions necessary for raising the young weak animals led to an unfortunate misunderstanding in biological science. As Prince Kropotkin suggested "men came to conceive the animal world as a world of perpetual struggle among half starved individuals, thirsting for one another's blood. They made modern literature resound with the war cry of 'woe to the vanquished' as if it were the last word of modern biology. They raised the 'pitiless' struggle for personal advantages to the height of a biological principle which man must submit to as well, under the menace of otherwise succumbing in a world based upon mutual extermination." What we have found instead of "nature red in claw and tooth" is the great principle of charity, or the dearness of fellow-beings existing all over nature. The animals help each other, many of them delight to play with each other and animal sports are common, they care above all for the young and the weaklings and for whatever of evolution has come this has been a prominent factor. The struggle for existence is incidental to life but the great law of mutual aid is a fundamental instinct in living beings, a basic anticipation of the law of charity among men which though often violated remains deep in human hearts as the impress of brotherhood.

The theory of evolution and of descent was very seriously disturbed by Weismann's injection into the discussion of the principle of the non-inheritance of acquired characters. It was easy to theorize that anything acquired by an animal in its struggle for existence would make it more likely to be preserved and this would give the next generation a better chance and would be passed on in ever more favorably modified forms to succeeding generations until a new species would result. Once it came to be acknowledged however as it had to be, that acquired characters are not transmitted, or so rarely as to be quite an exception to the order of nature, then this scaffolding of theory collapsed, leaving some other explanation of the gradual improvement of living things to be evolved. As pointed out by Driesch the only thing that would explain the upward steps in descent is that definite heightening impulses were put into living things from without with the purpose that they should improve in order of being. In this too modern science finds itself under the necessity of recurring to a creative impulse, a creative evolution, such as was included in the explanations of the great philosophic fathers of the Church. Darwin in his 'Descent of Man' said "The birth both of the species and of the individual are equally parts of that grand sequence of events which our minds refuse to accept as the result of blind chance" (Vol. II, p. 396).

The argument from design in the world for the existence of a Creator is now actually stronger than ever in scientific minds, and a review of all the purposes that exist among living things makes it quite impossible to believe that they were developed without a Designer. The telling arguments against ultra-Darwinism, the evidence that the struggle for existence and natural selection are not only not exclusive factors, but not even important elements in the differentiation of species, have been found in those domains of creation which exhibit the strongest proofs of design. The story of the complex instincts of many animals and particularly the insects make it very clear that they could not have come into existence by any mere chance, that is, purposeless succession of events and least of all by any accumulation of minimal fortuitous changes which finally modified function and organ to the extent needed for the perfecting of instincts as we know them. Insects would have been handicapped rather than favored in the struggle for life during the intermediate stages of the development of these instincts and the apparatus connected with them. They would therefore have perished before the instincts had become useful. Fabre, the great French entomologist whom Darwin proclaimed "an incomparable observer," has been the strongest opponent of natural selection or chance being in any way responsible for insect instincts. He insists that it is quite impossible to conceive of these instincts coming into existence except as the result of design. Fabre, discussing the modern theory of instinct, does not hesitate to say that "theories of atavism, of natural selection, of the struggle for life cannot interpret it reasonably." He even went so far as to add with regard to theoretic explanations of the life and instincts of the insects — and surely no one had a better right than he to an opinion on this subject — that he saw in them "no more than an ingenious game in which the arm-chair naturalist who shapes the world according to his whim is able to take delight but in which the observer, the man grappling with reality, fails to find a serious explanation of anything whatsoever that he sees." For Fabre every portion of the insect world is a manifestation of design. "The wing of a cricket, that wonderful piece of lace work emerging from a tiny sheath, speaks to us of

another Architect — the Author of the plan according to which life labors."

Regeneration is the other phase of biology which after instinct has served to make it very clear that any chance result of the struggle for life could not serve as an explanation of biological developments. Professor Thomas Hunt Morgan of Columbia University did not hesitate to say that there are "insurmountable objections to the view that the process of regeneration can have been produced by natural selection." He quotes Driesch that "We can only reach a satisfactory view of the phenomena (of ontogeny) when we introduce the word purpose. This means that we must look upon ontogeny as a process carried out in its order and quality as though guided by an intelligence." Teleology then has come back with redoubled force, and anyone who is not willing to stop short of our ordinary processes of reasoning in matters of science must recognize the existence of design and the constant manifestation of purpose in living things around us.

Once this is admitted the reversion to the old Christian doctrine of Creation and of conservation in the sense not only of preservation but of the provision of such additions to energy as may be needed for developmental purposes becomes imperative. These are really successive creations beyond nature's unaided powers. It is true that many scientists refuse to take the logical step in this direction, but it seems clear also that their determining reason for doing so is that they cannot bring themselves to revert to the conservative position of the older time. Weismann for instance suggested that if there was no such thing as spontaneous generation scientists would have to admit creation. He confesses frankly that all the scientific evidence of the present time is distinctly against the occurrence of spontaneous generation, yet he insists that it is the duty of scientists to accept abiogenesis rather than to concede the necessity for creation. With creation as the beginning of life and this origin of "the seeds of things" with the absolute necessity for some extraordinary intervention to bring about the differentiation of man the thinker from the animals, the necessity for a creator is affirmed by science; hence the declarations to this effect made by many distinguished scientists of the 20th century. Indeed the greater the scientist the more conservative is his position in this matter as a rule. Evolution so far from contradicting Christian teaching has simply served to make clearer the process by which man's origin was brought about and his relationship to the world around him. Absolute freedom is left for further research in speculation along these lines and Catholic biologists particularly have never felt themselves hampered in the slightest degree by their faith or by the teaching of the Church in the matter.

Many students of science and particularly readers of popular science have become persuaded that the so-called biogenetic law gave absolute assurance not only of man's descent from the animals but of his origin from a single cell being and his progress through the various forms of life up to his present physical status. The human, like other embryos, is supposed to pass through stages which indicate very clearly that it follows the law "ontogeny recapitulates phyllogeny." As Koken remarked very justly, the so-called biogenetic law originated in a superficial view of facts. The more embryology has been studied the less scientists have been willing to accept it. Oscar Hertwig insists that in any statement of the law we must leave out the words "recapitulation of forms of extinct ancestors" and substitute for them "repetition of forms regularly recurring in organic development and advancing from the simple to the more complex." Almost needless to say this destroys the original significance of the law. There is scarcely any question now among biologists that the stages noted in the embryonic development of man, or of any other animal, are there not because they serve to record a repetition of ancestral forms, but it is definitely taught that they are there because they are needed for the existence and development of the particular individual at that time. It happens that they resemble similar stages in other and sometimes much simpler creatures, but that does not justify the leap to the conclusion that there is any such connection as would be indicated by a law of cause and effect between such similar forms. About all, as pointed out by Weismann, "the resemblances between the human embryo and that of the other vertebrates are so superficial that His, W. von Bischof, Karl Vogt, and many other recent and thorough students of comparative embryology, have protested against Haeckel's views regarding these resemblances as phylogenetically significant identities." He concludes "Nothing but gross want of knowledge can excuse a man at the present day in bringing forward this *argumentum ex ignorantia* in support of the descent of man from beasts." The recapitulation theory has been a favorite source of arguments in education, the social sciences and other scientific modes on which the theory of evolution was thought to throw great light. On it has been made to depend many of the unfortunate applications of the evolutionary theory. Professor Kellogg suggests that "the recapitulation theory of Fritz Muller and Haeckel is chiefly conspicuous now as a skeleton on which to hang innumerable exceptions."

Conservative Christian views with regard to the origin of man have been still more strongly confirmed by the recent immense developments of the science of archæology and the increase of our knowledge of the story of man's existence, not from theory, but from actual remains obtained in the course of excavation. Under the influence of the theory of evolution as a background of their knowledge the last generation of the 19th century were persuaded that human beings were in process of making wonderful progress which could be traced almost from generation to generation and surely from century to century. Scientific archæology has made it very clear that man at any time in his history when he was interested in any work was capable of doing wonderful things which stamped him as separated by a very great gap from the animal. Succeeding generations of men have often utterly failed to advance above their forebears as we know them by actual remains, but on the contrary degeneration has been at least as common a rule in history as progress. The whole question as to whether mankind has ever made any progress has come up and Flinders Petrie, acknowledged as the authority in Egyptology, does not hesitate to

say that "what strikes us most is how very little man's nature or abilities have changed in 7,000 years, for what he admired we admire; what were his limits in fine hardiwork are also ours. . . . So far as human nature and taste go man is essentially unchanged in this interval."

If man's origin was an act of creation due to the breathing of something Divine that made him like his Creator into his animal body, we might expect to find in him something like this permanency of status. This rather surprising contradiction of the ordinarily accepted idea of facile progress has been strikingly confirmed by the further advance made in archæology in the study of the cave man. The excavations in the Dordogne and in western and southern France and northern Spain have completely contradicted the idea that man began low down in the scale of being, scarcely above the beasts, and gradually climbed up. They have shown on the contrary that the very first man of whom we have any definite records many thousands of years ago was the intellectual and the spiritual brother of man as we know him now.

The scientific fallacy which has traced man's gradual development from a status just above that of the beast to his present high state of civilization has been due to neglect of the real significance of human life. In the utilities man began low down in the scale and had to develop gradually the things that would help him in his physical life. The notion that this was the only side of man that could possibly have been developed in those early days and that his higher æsthetic evolution could only come much later was entirely an assumption. It led scientists to conclude that the history of man as a tool-maker and a tool-user represented the progress of humanity. What was revealed by the discoveries made in the cave dwellings was that man cultivated first the arts and gave play to his sense of beauty and only later turned to the development of the utilities. Before man was a carpenter and made himself artificial houses to live in, dwelling in the caves that he found so convenient, and before he was a tailor and fashioned his garments to facilitate his work, or a farmer to till the soil and give himself leisure between sowing and harvest, he was an artist and an artistic craftsman whose work now revealed to us commands the reverent regard of the modern world.

When it was first discovered that there were many remains indicating that a number of generations of man had dwelt in the caves of what are now France and Spain the conclusion was jumped to at once that the cave man stage of existence must represent a period in which men were just a little higher than the animals. They were crafty enough to displace the beasts from their lairs in the hillsides and cunning enough to keep them out. Scientists in their eagerness to confirm the theory of evolution went much farther even in this assumption. They represented the cave man as the lowest of savages, quarrelsome, utterly selfish, with no interests except those of his body, ruthlessly ready to fight with his kind on the slightest provocation or even without provocation if he felt that he had the strength or the chance to kill without danger. A favorite theme was that he dragged his female home by violence to keep her as his own, to bear his burdens and his children, the one saving quality in the picture being his care for his children, though even this was supposed to be neither consistent nor continuous.

This was the supposedly scientific picture of the cave man that was popularized and the general public has as yet no idea apparently that the discoveries of actual remains in the caves completely contradict this theory. Three modes of art were found in the caves, the movable art, consisting of various utensils decorated prettily, the mural or parietal art of pictures made on the walls of the caves to which more recent discoveries have added the plastic art of rock sculpture and molded clay. The engravings on bones and horns and sometimes on stone implements revealed that a real artist was at work in this olden time. He was a man who saw clearly and could reproduce with fine fidelity often by means of a very few lines what he saw. His work while primitive was not crude, but anticipated in many ways modern impressionistic art, the latest phase of artistic development. There must have been a good many men of the time capable of doing excellent work in this line for copious remains in many places and even at different horizons, which indicate intervals of generations, have been found.

What is extremely interesting is that the cave man should have tried to make beautiful even the every-day utensils that he handled and that he was willing to spend a good deal of time and care in their decoration. One suggested criterion of cultural advance among men has been that "there is no culture in the hearts of a people until the very utensils in the kitchen are beautiful as well as useful." The cave man judged by this criterion is rather in advance of than behind most of the peoples of history in higher human development. His cave home we have come to recognize especially after trench experience was healthier than the dwellings of the great majority of the human race at the present time, not alone the poor, but even the rich. He tried to make his home a place of beauty for himself and his family. If we are to judge by how such a thing comes about in the history of long after times, we should be forced to the conclusion that it was the cave woman who somehow had succeeded in securing the surroundings of artistic quality for herself and the children who had to spend so much more time at home than the cave man himself.

If there had been nothing but the movable art of the caves that in itself when properly appreciated would have completely corrected the notion of the cave man as in any way near to the animals. On the contrary he was a modern man in his interest in beautiful things. The discovery of the parietal or mural art emphasized this very strongly. The walls of the caves were found to be decorated in many places with pictures of the animals which the cave man hunted. The evolution of this art has now been traced and it manifestly began in black and white, that is, the gray wall of the limestone cave as the background for deep lines made with a sharp piece of flint and then filled with lamp black as the outline of the picture. The surprise is to find the boldness and sureness of the drawing, the almost complete absence of corrections and the thoroughgoing confidence with which the cave artist must have made his

pictures. He knew exactly what he wanted to reproduce and there was no halting or hesitation about his line work. Modern artists have not hesitated to declare that some of this drawing must be counted among the best that has ever been done, especially when the circumstances in which it was accomplished are considered.

The cave man was not satisfied with these line drawings vivid and expressive as they are. He wanted to reproduce the colors of the animals as he saw them and succeeded in doing so. At first he used only the reds and browns, but after a while also the yellows and many shades of colors. His color sense was evidently exactly like ours and he reproduced the animals as he saw them. The reason why his colors lasted so well during all these years is that they were ground in oil. This inventor of oil painting has made some of the most vivid pictures of animals that have ever been made. He pictures them in all positions, standing, lying down, in all kinds of movement and at bay. He even took advantage of certain somewhat rounded projections of the walls of his cave home to fit his pictures of animals to these surfaces in relief in such a way as to give the impression of plastic work. His power to accommodate his painting to the cramped conditions necessary for this, show what fine command he had over his artistic powers. The men who did this work far from being close to the beasts are quite as high as the men of our time, indeed if anything on the average higher. It is not at all surprising to find that they were magnificently developed and had a skull a little larger than the average of the men of our time.

These pictures were often made on the cave walls at such a distance from the entrance that the darkness was complete. Just what kind of light the cave man used has not been found. It was not torches, for there are no marks of smoke on the walls or ceiling. Sir Arthur Evans, who was president of the British Association for The Advancement of Science, did not hesitate to say in 1916 in his presidential address that the cave man had probably discovered some mode of lighting his cave, or otherwise he would not have been able to do the painting that is actually found there. It would not be surprising if the inventor of painting in oils should have made other inventions. He used fire in many ways and fire is, after all, one of man's greatest inventions.

The savage cave man of theory then so close to the beasts gives place when his actual remains are critically appreciated to a man the equal of any in the history of the race. An artist is at all times the flower of our civilization and evidently many of the cave men were artists. Further discoveries give indications of rather happy domestic life, his wife being pictured as rounded and fat though the cave man himself is muscular and athletic, evidently fitted for the difficult task of hunting the animals. Had his wife been the slave that she is pictured in theory she would not have been anything like the portraits that we have of her. There are manifest signs in some of the drawings of her liking for dress and already in various places there are various fashions with longer and shorter skirts and higher and lower corsages and ribbons and other adjuncts of fashion (Sir Arthur Evans). Above all the cave man carefully buried his dead with some of their weapons and utensils near them and with other evident indications of his belief that death was not the end of life, but that there was another life. He was perfectly willing to sacrifice some of the finely decorated and well-fashioned utensils that had taken a good deal of time in the making, in order that his dead ones might have near them in the other world their favorite implements of this. In a word archæology has shown us the first man of whom we know anything definitely, as a reasoning being with a highly developed sense of beauty, with a belief in immortality, with feeling for others, with a compelling tendency to surround himself with beautiful things as far as he could and not with that supposed tendency to occupy himself exclusively with utilities which instead of representing development always indicates a tendency at least to degeneration.

The one question that remains then is whether there is room in Biblical chronology for the record of man as worked out by science. Here once more the conservative views of the early Fathers of the Church are extremely important in enabling us to understand what should be looked upon as the prevailing belief in these matters. The supposed incompatibility of science and faith in the matter is entirely due to a comparatively recent misunderstanding of the Scriptures. Some of the early Fathers of the Church took the days of creation literally, but the Alexandrian Fathers who faced these problems in true philosophic temper interpreted the days of creation ideally, taking the words of Genesis as a human mode of speech so that men might understand what was expressed in terms of their previous knowledge. Such distinguished Christian philosophers as Clement, Athanasius, Cyril and Origen, as well as Saint Augustine, taught that creation was a single act. Augustine as we have seen declared that "the seeds of things" were first created and then went on developing because of the living power put into them.

The Fathers manifestly did not feel that a definite date for the creation of man was set by the account in Genesis. It was Archbishop Usher under post-Reformation influences who first calculated that the creation of Adam was 4004 B.C. Indeed the literal interpretation of the rather vague wording of Scripture with regard to many things is quite modern as a rule. As in the question of a universal deluge, which is not Biblical, more careful study of the scriptural text shows that there is no good reason for any such limitation of time as Usher suggested. There is absolute freedom to discuss the age of man on earth as far older than any such date. Rev. Father Obermaier and Abbé Breuil, to whom we owe more of our exact knowledge as to the cave man and our earliest ancestors than any others, have discussed the probable date of this dwelling in caves very fully. Obermaier thinks that 50,000 years might be necessary to include all phases of development that have thus far been unearthed. Abbé Breuil is of the opinion that 20,000 years would be quite sufficient for all that recently discovered facts as to man's development would demand. Their opinions deserve the highest consideration from students of science. The lower figure is confirmed by the conclusions of Prestwich, a well-known authority on geology, who

limits the time since the Glacial period to 25,000 years and man is surely post-glacial.

Many presume that at least modern science has completely obliterated the old-fashioned notion that man was the centre and the culmination of creation for whom other parts were made and to whom their activities were mainly directed. Alfred Russell Wallace, however, in his volume, 'Man's Place in The Universe' has re-established that old idea on the firmest of modern scientific and evolutionary bases. Surely no one can talk with more authority in the matter than the man who with Darwin discovered the principle of natural selection. Wallace goes so far as to say "and is it not in perfect harmony with this grandeur of design (if it be design), this vastness of scale, this marvelous process of development through all the ages, that the material universe needed to produce this cradle of organic life and of being destined to a higher and a permanent existence, should be on a corresponding scale of vastness of complexity and of beauty? During the whole process of the rise and growth and extinction of past forms the earth has been preparing for the ultimate man — much of the wealth and luxuriance of living things, the infinite variety of forms and structure, the exquisite grace and beauty in bird and insect, in foliage and flower, may have been mere by-products of the grand mechanism we call nature — the one and only method of developing humanity."

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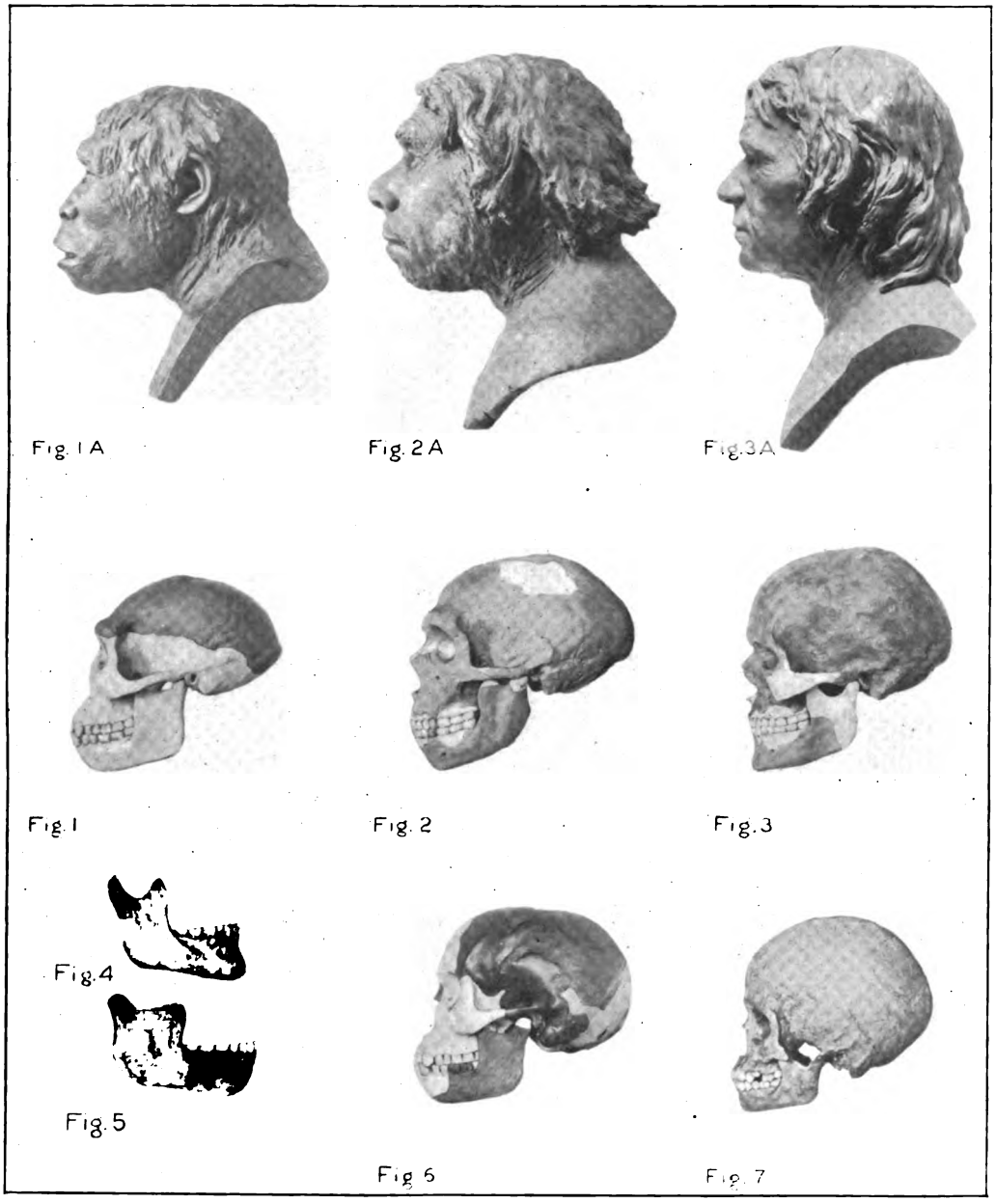
JAMES J. WALSH,
Author of 'The Popes and Science,' etc.

MAN, Isle of. See ISLE OF MAN.

MAN, Prehistoric Races of. Until nearly the middle of the 19th century, the dawn of human existence was commonly assumed to have been coincident with the beginning of recorded history, roughly some 6,000 or 7,000 years ago. Though even in the preceding century some evidence had been adduced which indicated that a stone-using age had antedated the use of metals, it was not until 1833 that the discovery in the caves of Engis, near Liège, Belgium, of human bones mingled with those of mammoth, wooly rhinoceros and cave-bear proved (though the proof was not universally recognized for several years) that man must have been a contemporary of these extinct creatures of the remote Diluvial epoch, or, as it is called to-day, the Glacial or Pleistocene period. Together with this discovery two others stand out as prominent landmarks in the history of palæoethnology. One was the finding, in 1856, of the famous Neanderthal skeleton, which demonstrated that a low type of mankind, physically very different from any modern race, had existed in western Europe in some distant prehistoric time, now known to have been earlier in the Pleistocene than the period of the Engis men. A few years later a fragment of mammoth tusk was found on which was scratched a realistic portrait depicting the hairy mammoth in the flesh, showing that considerable artistic ability had been achieved by man before the extinction of these great Pleistocene elephants, at a time antedating recorded history. Since these pioneer discoveries, evidence has accumulated greatly and we now know that the man who made this engraving some 15,000 or 20,000 years ago was fairly recent in comparison with the low-browed Neanderthal, and that the latter was antedated in turn by a still more primitive and probably ancestral type, the Heidelberg man, of vastly more remote antiquity. It may be stated here that our knowledge of Pleistocene ethnography is based very largely on European material with a few exceptions to be mentioned below, but this does not imply that Europe is to be regarded as the cradle of the human family, for the consensus of competent opinion is that the earliest hominidæ diverged from their simian relatives in central Asia, probably in Miocene times, and that from this centre the family gradually radiated, its branches becoming geographically isolated, some dying out during the Pleistocene, and others finally becoming differentiated into the several great divisions of mankind — Australian-African, Polynesian-European and Asian-American, and their racial subgroups. See MAN.

This is not the place for a discussion of Pleistocene geology or of the much-disputed Ice Age chronologies; it must suffice to say that the duration of the Pleistocene, according to the estimates of Penck, one of the leading authorities, was between 500,000 and 1,500,000 years, and other investigators usually make it near his minimal figure. There is evidence that there were in the northern hemisphere not less than four glaciations, with three warmer interglacial periods, the beginning of the recession of the fourth and last ice-sheet dating back perhaps 17,000 to 25,000 years. As to the time of the earliest appearance of actual man, the genus Homo, we are probably well within the limit of likelihood if we assign to the Heidelberg man, the oldest known type, an antiquity of 250,000 years. Contrasted with such age as this the so-called historic period of some 7,000 years seems a brief span indeed. The comparison becomes most graphic if we represent the duration of man's past by the length of a yard-stick, in which case the extent



Figs. 1, 1A, 2, 2A, 3 and 3A from restorations by J. H. McGregor

Fig. 1 Skull of Pithecanthropus erectus, restored

Fig. 1A Head modelled on 1

Fig. 2 Skull of Homo neanderthalensis; specimen from La Chapelle-aux-Saints, restored

Fig. 2A Head modelled on 2

Fig. 3 Skull of the "Old Man of Cro-Magnon," restored

Fig. 3A Head modelled on 3

Fig. 4 Jaw of modern man (American Indian) for comparison with

Fig. 5 Jaw of Homo heidelbergensis

Fig. 6 The Piltdown Skull, Eoanthropus dawsoni, restored by A. Smith Woodward

Fig. 7 Skull of youth of Grimaldi race. (After Verneau)

of recorded history will be fairly measured by the terminal inch.

Any discussion of the earliest types of man must include some mention of Pithecanthropus, "the ape-man of Java," though the relation of this most famous of fossils to mankind is still dubious. In 1891–92, Dr. Eugène Dubois of Holland, while conducting geological explorations in central Java, unearthed in the dry bed of the Solo or Bengawan River, near Trinil, a fossilized skull-cap or calvaria, two molar teeth, and at a distance of some 50 feet from these, a thigh-bone, all clearly of primate character and presumably from a single individual. The thigh-bone was more man-like than that of any ape, its conformation indicated erect gait and its size a creature some five feet six inches tall. The cranium had an extremely narrow, low and retreating forehead with a prominent transverse ridge above the orbits and a capacity of 850 to 900 cubic centimeters, or about midway between the lowest normal human and the gorilla in bulk of brain, though somewhat nearer the minimal human measure. In 1894 Dubois published a careful study of these remains to which he assigned the name *Pithecanthropus erectus* (erect-standing ape-man), and which he hailed as the long-hoped-for "missing link" between ape and man. The exceptional importance of the fossil was generally recognized at once, but authorities have never unanimously agreed with Dubois' view concerning its intermediate position. A considerable number of anthropologists place it within the human family, and the literature contains many references to "Trinil Man." Elliott Smith, following Dubois, believes that certain brain-impressions in the skull suggest the power of articulate speech. On the other hand, some able anatomists incline to regard the creature as more closely allied to the apes, and it has even been considered a giant gibbon. In view of the incompleteness of the remains and the slightly uncertain association of the femur with the skull, it is perhaps best to regard Pithecanthropus tentatively, simply as an extinct primate of erect gait, much higher as to brain volume and presumably as to intelligence than any known ape; hence a sort of "super-ape," but much lower in mentality than any normal man. In any case the assumption that it is necessarily a direct ancestor of Homo is unwarranted, for it may equally well belong to a collateral branch of the hominid family which became extinct,—"an uncle instead of a grandfather of man"; but it must be admitted that Pithecanthropus admirably fills the specifications for a "missing link." Unfortunately, its geological age is somewhat uncertain; it is either late Pliocene or early Pleistocene. Osborn tentatively estimates its antiquity at 500,000 years. (Figures 1 and 1A.)

The earliest remains which are unquestionably human consist of a remarkable lower jaw found in 1907 in the Mauer sands, ancient river deposits near Heidelberg, Germany. Proof of the vast antiquity of the specimen is afforded by superjacent strata nearly 80 feet in thickness, and by the associated mammalian fossils, including species of elephant, rhinoceros, etc., which had previously been assigned to the second (by some to the first) warm interglacial phase. This human relic is not only vastly ancient, but more primitive, in some respects more ape-like, than any other indubitable human remains. The jaw is exceedingly massive and large and entirely lacks the chin projection of modern races, which gives it a remarkably ape-like appearance (Fig. 5), but the teeth and the form of the dental arch prove it to be quite human. Professor Schoetensack, who described the fossil, makes it the type of a new species, *Homo heidelbergensis*, the Heidelberg man. It resembles the Neanderthal type somewhat and may be ancestral to it. No cultural remains were found associated with the jaw and opinion is divided as to whether this type had attained even the level of culture represented by the earlier Palæolithic flints, though some anthropologists place the "eoliths" still earlier. As the second interglacial period is believed to have extended over some 150,000 years and to have merged into the third glacial some 150,000 or 200,000 years ago, it seems not unlikely that Heidelberg man may have flourished some 200,000 or 250,000 years ago and for aught we know to the contrary his race may have endured for tens of thousands of years, countless generations passing without leaving a trace save this single fossilized jaw. The interval which elapsed from the day when this precious relic found its resting-place in the ancient river-sand to the period of Neanderthal man was probably vastly longer than that between Neanderthal times and our own day. Nevertheless it must be understood that estimates of Pleistocene chronology vary greatly and are all highly conjectural.

Perhaps the greatest event in the history of anthropology was the discovery, in a limestone cave in the Neanderthal, a small gorge near Düsseldorf, Germany, in 1856, of the fragmentary skeleton of a man apparently contemporaneous, like the men of Engis, with the well-known mammoth and wooly rhinoceros, the bones of which were found later in similar caves nearby. Examination of the human bones revealed surprising differences from modern Europeans or indeed any race of living man, or even the Engis man. This was especially striking in the calvaria or skull-cap, which was marked by an excessively low crown and heavy supra-orbital ridges extending the entire width of the forehead. This skull excited great discussion; Huxley spoke of it as "the most pithecoid (ape-like) of known human skulls," and in 1864 King ventured to make it the type of a new species of man, *Homo neanderthalensis*. The names *H. primigenius* and *H. mousteriensis* have since been applied to this race by certain German and French writers. Since this pioneer discovery numerous remains of the species have come to light and Neanderthal man is known to have ranged from the lower Rhine region to southern Spain and eastward at least to Austria. A nearly complete skull was found at Gibraltar in 1848, thus antedating the Neanderthal discovery by eight years, but it was inadequately described and its significance remained unrecognized for half a century. The more important Neanderthal remains include two skulls from Spy, Belgium, found in 1887, a large number of bones and teeth found in 1899 and later at Krapina, Austria, two nearly complete skeletons in France, namely, the old man of La Chapelle-aux-Saints, Correze (Fig. 2), and a youth from Le Moustier, Dordogne, both discovered in 1908, and three

still more recent discoveries of partial skeletons, not to mention numerous jaws and teeth. The Neanderthal custom of burial in caves is largely responsible for the preservation of some of the finest of these remains. They have been found associated with various culture levels of the Palæolithic or Old Stone Age, but chiefly identified with the flaked flints of the Mousterian industry. It seems highly probable that a species so widely distributed endured throughout a long period, possibly the greater part of the third interglacial and the fourth glacial, upwards of 100,000 years in all, and there is some reason based on differences of cranial form to suspect that the type became split up into sub-species or races. The skeletal anatomy is now well known, and much can be inferred with certainty regarding the muscles and other soft parts. They were a people of rather small stature, the men five feet three or four inches tall, of extremely robust built, with large bones, and heavily muscled. Hands and feet were large, the thighs somewhat curved forward and the knees always slightly bent. The forearm and leg are remarkably short in proportion to arm and thigh. The skull was characterized by huge size, especially great length, the low-crowned but capacious cranium marked by a projecting transverse ridge above the eyes. The orbits were cavernous, and the eyes probably deeply set, the nose very wide but prominent, not flat as in negroes. The face was of great length with some prognathism, though the anterior teeth were nearly vertical. The cheeks sloped backward obliquely from the nose, quite unlike any modern race, and there was the merest suggestion of a chin (Fig. 2A). This huge head was supported on a very short neck, directed somewhat forward. Altogether the appearance of the Neanderthal was such as to suggest the adjective "bestial" and admirably fulfils the popular conception of a brutal, low-browed cave man. Regarding such superficial features as complexion and hair, of course nothing is known. A few ethnologists regard the Neanderthals as a degenerate type. As to culture, we know that he flaked the flint implements of the Mousterian phase (probably also the still earlier Acheulean and even Chellean), of which one characteristic form is the "coup de poing" or fist-hatchet, and others are obviously for cutting up game, scraping skins, etc. The charred bones found about the rock-shelters of the limestone cliffs show that he possessed the art of making fire and that he roasted the flesh of the wild horse, wild ox and reindeer. Several of the skeletons had been carefully buried, together with stone implements and parts of game animals, a practice usually considered to indicate some idea of post-mortem existence. As to the origin of the Neanderthals, it has usually been supposed that they migrated into Europe from Asia, but the recent discovery of the earlier and more primitive but somewhat similar Heidelberg man, suggests that the Neanderthals may have evolved in Europe. Before the end of the fourth and last glacial phase, the species seems to have become extinct, and to have been replaced rather suddenly by at least two races of *Homo sapiens*, early representatives of our own species, but the relation of the Neanderthal to these higher types, and whether or not he has any share in the ancestry of modern Europeans, is still questionable. The weight of opinion seems to favor the view that he was exterminated by higher immigrant races, but in such cases there is usually some crossing and no less an authority than Hrdlička believes that slight traces of Neanderthal blood are still discernible in certain regions of Europe.

Among the successors of Neanderthal man, and possibly contemporaneous with him during the later centuries of his epoch, was the highly developed race first known from several skeletons discovered in 1868 in a grotto at Crô-Magnon, near Les Eyzies, Dordogne, and named from the site of discovery the Crô-Magnon race. The half century since has witnessed a considerable accumulation of data relative to the physical features, distribution and culture of this people. In many characters the Crô-Magnon men closely approximate certain modern types. The head form is dolichocephalic, with vertical forehead, prominent narrow nose and strong chin (Figs. 3 and 3A). The orbits are low and elongate transversely; the cheek-bones very wide in proportion to the cranial form. The skeletons from certain stations are of great height, over six feet, but others, apparently of the same race, are much shorter, and the women seem to have been much smaller than the men. In general this race had well-formed heads and fine physiques. Plainly, the Crô-Magnons are of our own species, *Homo sapiens*, and their likeness to certain modern types in southwestern Europe suggests that a strong strain of the blood of this ancient race still exists. Verneau has also adduced evidence for the belief that the Guanches, the aborigines of the Canary Islands, were of this stock. One or two recent writers have asserted that the Crô-Magnons show negroid affinities, but except for the relative proportions of the limb bones, the evidence is all opposed to this view. The race appears so suddenly and is so different physically from the Neanderthal as to preclude descent from the latter; hence it is generally believed to have migrated from Asia. In early postglacial time the Crô-Magnons attained a wide distribution in western Europe, their range closely approximating that of their more primitive predecessors. In a number of localities remains have been found associated with rich cultural data, and the race is identified with those late phases of the Old Stone Age known as Aurignacian, Solutrean and Magdalenian, characterized by a great variety of flint implements, knives, spear-heads, chisels, borers, scrapers, etc., of delicate workmanship, and tools of bone and antler such as needles, spear-throwers and harpoons, as well as incised drawings on reindeer antler, mammoth tusk and stone depicting the great mammals which still survived — the mammoth, wooly rhinoceros, wild horse, reindeer, lion and others. The Crô-Magnons were a race of troglodytes, more truly cave men than were the Neanderthals, and to this race belonged the mural artists whose brilliant polychrome paintings of contemporary animals still adorn the walls and roofs of caverns in southern France and northern Spain. Ceremonial burial of the dead was practised and some of the burials show that ornaments were worn. Clothing, doubtless of skins, is in-

dicated by the bone needles. On the whole, these people had attained a considerable degree of culture, but there is no evidence that they practised agriculture, or kept herds, or that they had achieved the domestic arts of pottery or weaving. They were a race of hunters, apparently with more or less fixed abodes and some organized social structure. Geological evidence indicates that the early postglacial period, during which the Crô-Magnons flourished, was some 10,000 to 20,000 years ago. It seems improbable that this race was exterminated; it is more likely that it became intermingled with other immigrant stocks, progenitors of Neolithic men, and there are indications that a Crô-Magnon strain still persists in the population of certain localities in France.

A considerable number of skeletal remains of late Pleistocene Age have come to light in Europe, some of which are doubtfully to be assigned to the Crô-Magnon race (*e.g.*, those of Engis and Combe-Capelle) while others, notably the Brünn and Galley Hill crania, seem to belong to a different physical type, but clearly *Homo sapiens*. In 1906 a surprising discovery was made in one of the caves in southern France which had previously yielded several Crô-Magnon skeletons. This was the disinterment, from a slightly lower level, of two skeletons, a woman and a youth (Fig. 7), which strikingly resemble certain negroid types, especially the South African Bushmen. The name Grimaldi race has been given to these ancient negroids, but it is impossible, as yet, to account for the origin of the race except to say that they were early postglacial immigrants. It is significant that several small sculptured statuettes from France, and one from Austria, appear to represent female negroid types in whom certain physical features are exaggerated as in Bushmen women. Presumably these are the handiwork of the Grimaldi negroid race. These discoveries are important as demonstrating the early diffentiation of a negroid stock, and they suggest interesting questions as to its prehistoric migrations.

The "Piltdown skull" found in Sussex, England, in 1911–12, has perhaps evoked more vigorous discussion and more divergence of opinion than any similar discovery. The bones were found in a shallow gravel-bed, are unquestionably Pleistocene, and probable as early as third interglacial. With them were found teeth of very early types of elephant and hippopotamus, and a few roughly chipped "eoliths." There are several fragments of a human cranium of great thickness, but which any anatomist would identify as *Homo sapiens*. Near one of these was found the right half of a lower jaw containing two molar teeth. This jaw is a veritable "bone of contention" for a number of able anatomists regard it as belonging not to the associated human cranium but to a fossil ape, though no such animals are known to have lived in England during the Pleistocene. The chin region is entirely ape-like, the molars somewhat so, and, the same may be said of a canine tooth, discovered later.

Dr. A. Smith Woodward, in the belief that the discovery represents an exceedingly early hominid, essentially an ape-jawed man, created for it a new genus and species, *Eoanthropus dawsoni* (the dawn man), the specific name in honor of the discoverer. Dr. Woodward's restoration is shown in figure 6. The British anatomists generally accept the validity of *Eoanthropus*, and regard it as a discovery of prime importance in the ancestry of the genus Homo, but outside the British Isles opinion is divided. Those who maintain that the jaw is that of an ape, hold that it, together with the bones and teeth of other animals, became accidentally washed out of their original resting places and mingled in the river gravels with the human remains. G. S. Miller, as a result of careful comparative studies, regards the jaw as undoubtedly belonging to an extinct species of chimpanzee. Of course if this view is correct, Woodward's genus "Eoanthropus" is only a figment, and the cranium merely that of an early man of our own species. At present it would seem that Eoanthropus can be only tentatively accepted, pending further evidence.

As above stated there are strong reasons for believing that the human family originated in central Asia and thence deployed in various directions. Besides the western migrants who gradually spread over Europe, others worked southward and populated the African continent, and the possible relation of the Grimaldi type to some of these has been mentioned. There is evidence that the Bushmen, at least, have drifted from more northerly parts of Africa, and some reason to suppose that they were preceded in South Africa by a Palæolithic people of stronger physique. A fragmentary skull of large size found at Boskop, in the Transvaal, in 1915, is believed to be of Pleistocene Age. It is not sufficiently complete to permit certain diagnosis as a negroid type. Broom has named it *Homo capensis*, but the reasons for erecting the new species seem inadequate to the present writer.

The African, Australian, Papuan and Melanesian peoples, descendants of stocks which spread southward from Asia, have a number of characters in common. Of these races the Australian blacks and the recently extinct Tasmanians are modern Palæolithic men and represent a cultural level scarcely higher than that of the Neanderthals. Their early segregation from other races is generally admitted, but thus far the only Australian discovery of great antiquity is a cranium, the Talgai skull, found in a Pleistocene formation in Queensland. and described in 1917, by Dr. Arthur Smith. This skull, though badly crushed, shows the essential features of the very distinctive Australian type, but is remarkably primitive, almost ape-like, in the rectangular form of the palate, and the enlarged canine teeth; just such a skull as one might posit as a Pleistocene progenitor of the Australian race. This discovery is highly significant as proving the early human invasion of the continent, and the differentiation at a time so remote of the Australioid type.

Though actual remains of Pleistocene man in the western hemisphere are extremely rare, and the antiquity of most of these somewhat questionable, there are excellent reasons for believing that a branch of the human species had become established in America before the last glaciation, an offshoot from the same eastern Asian division which gave rise to the Mongolian peoples. These first American immigrants probably entered the continent in the region of Alaska, when that part of the world

enjoyed a more genial climate than was later the case, and spread eastward and southward, finally extending to the southern extremity of South America. This view, however, is not universally held, and some competent ethnologists maintain that the migration of the Eskimo has been westward from Greenland. The affinity of American to Mongoloid peoples is generally admitted, as is also the racial unity of all the Americans from the Eskimo to the Fuegians. Prehistoric remains, both skeletal and cultural, are of course extremely abundant, but all of the former, including even those believed to be Pleistocene, exhibit the essential characters of the American Indian type. Among the more important discoveries of possible preglacial (i.e., before the last ice advance) or glacial age are several fragmentary skeletons from the Trenton gravels of New Jersey, and some bones of two individuals found at Vero, Fla., in 1915–16. A skeleton discovered in the famous asphalt pits of Rancho La Brea near Los Angeles, Cal., in 1914, and at first hailed as a Pleistocene man, is not different from the modern type, and is almost certainly postglacial. Various discoveries in Argentina described by Ameghino as Tertiary (Miocene and Pliocene) prehuman remains, to which he assigned the generic names of *Tetraprothomo* and *Diprothomo,* have been entirely discredited. It may be said in general that the essential Indian character of all the prehistoric remains found in America, and the likeness of this type to the Asian Mongols, indicate that the first American immigrants were already highly developed, and very similar physically to the Indian of to-day.

In this brief review of the ethnology of earliest man, the reader must have observed that the somatic evidence is extremely meagre, except in the cases of the Neanderthal and Crô-Magnon types. In several cases a race or even a species is based on a few bones from a single individual, but it must be understood that a few skeletal fragments, especially of the skull, may convey a great amount of information to the skilled anatomist, also that the location, associated animal remains and cultural evidences all aid largely in solving the riddles of mankind's remote past. It has not been possible to make more than a hasty survey of the physical characters of the earliest types of the human family. The late Palæolithic migrants into Europe,— the long-headed Nordic (northern) and Mediterranean (southern) races, and the broad-headed Alpine race, of great importance as the chief stocks from which the present peoples of Europe have descended, must perforce be omitted. For the consideration of the cultures of the Palæolithic, as well as of the Neolithic and Bronze Age, see ARCHÆOLOGY.

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MAN WITHOUT A COUNTRY, The. Few, if any, short stories written with a purpose have achieved that purpose so completely as did "The Man Without a Country," by Edward Everett Hale. Written during the Civil War, it did much to inculcate patriotism at a critical period in the fortunes of the Union. The story centres about Philip Nolan, a lieutenant in the army of the United States, who came under the influence of Aaron Burr, foreswore his country, and as a punishment was condemned never again to hear its name. To effect this, he is kept prisoner all through his long life, first on one ship, then on another, until at last he dies during the Civil War. Though the idea of life-long imprisonment on shipboard is in itself novel and striking, and the naval setting is worked out with remarkable attention to detail, the chief interest of the story lies in the development of the character of the hero, who, from hating his country, grows through suffering to love her with passionate devotion. All this is told so convincingly, with such a mingling of fact and fancy and with such a wealth of contemporary allusions, that thousands of readers believed it to be an account of fact. The germ of the plot was suggested to the author through the reading of Scott's 'Life of Napoleon.' It occurred to him that if Napoleon had been passed from ship to ship instead of being confined on Saint Helena England would have been spared much calumely and the French would not have turned Saint Helena into a shrine. The "local color," which adds so much to the story, was gained from reading the records of the navy and the proceedings in the trial of Aaron Burr. Immediately upon its publication in the *Atlantic Monthly* of December 1863, 'The Man Without a Country' became famous, was copied everywhere and was soon translated into foreign languages. It remains one of the most famous of American short stories, and among all the author's voluminous publications is the one most likely to retain its place in literature.

MARION TUCKER.

MAN-OF-THE-EARTH, a local name in the Southern States for the wild potato-vine (*Ipomœa pandurata*). See IPOMŒA; MORNING-GLORY.

MAN-EATER, a term applied to any fierce animal which has acquired, or is believed to have acquired, a habit of killing human beings as food. Lions, tigers, leopards and other great cats are accused of it, and undoubtedly many of these beasts, finding how easily a man or woman among East Indian or African villagers may be struck down or seized when sleeping in a flimsy hut, make their lairs near settlements and for a time regularly subsist upon human victims. Such are sometimes, but not always, old cattle-thieves, whose teeth are worn, and which feel unable or unwilling to undertake the exertion of tracking and pulling down wild animals; but this is not always the case. When

such a beast has taken his residence in a district no pains must be spared to kill him, for he will not cease his depredations. Horses, elephants camels, etc., sometimes become man-eaters in effect, understanding and exercising their power over him for harm.

A man-eater shark is the great white or blue shark (*Carcharodon carcharias*), which is one of the largest and most formidable of fishes. See SHARKS.

MAN IN THE IRON MASK, The. See IRON MASK, THE MAN WITH THE.

MAN AND NATURE, a work of great research written in 1864 by George Perkins Marsh (q.v.). Its full title was 'Man and Nature, or Physical Geography as Modified by Human Action.' The work became at once a standard with international recognition; a considerably enlarged Italian edition was issued at Florence in 1870; and a second American edition, with further changes, appeared in 1874.

MAN AND SUPERMAN. In his subtitle Bernard Shaw announces this work as "A Comedy and a Philosophy"; he might, with equal pertinence, have added "A Sermon on the Dangers of Romanticism and a Treatise on Biology, Anthropology and Social Psychology." It is all these and it is, none the less, a successful play which has been greeted with almost continuous explosions of delighted merriment by theatre audiences on both sides of the Atlantic and has entertained still larger audiences in its printed form. The accepted canons of dramatic criticism break down before the audacious genius of a Bernard Shaw; as his American biographer, Archibald Henderson, says, "He violates all the rules yet turns the trick."

That 'Man and Superman' is a thesis play goes without saying. The difficulty is that there are so many theses, so brilliantly, keenly and yet paradoxically expounded, that one leaves the playhouse, or lays down the book, in a state of high mental exhilaration tempered with an irritating sense of mental confusion. The main theme is, however, easily distinguishable; it is the contention, presented also in several other of Shaw's plays (notably 'The Philanderer,' 'You Never Can Tell' and 'Misalliance'), that in the perennial love chase it is woman, driven by the Life Force, who is the pursuer and man, the quarry. This contention is made to seem more arrestingly unorthodox by associating it with the Don Juan story. In the preface, addressed to the well-known English critic, Mr. A. B. Walkley (who figures in the prologue to 'Fannie's First Play' as "Trotter"), Shaw says, "You once asked me why I did not write a Don Juan play . . . The day of reckoning has arrived: here is the play!" The modern Don Juan as represented by the hero, John Tanner, is, however, no romantic libertine but a social revolutionist, irreproachable in his private conduct, but implacable in his revolt against false and outworn conventions, determined to save himself from the bondage of love and marriage, but succumbing in the end to the inexorable demands of the Life Force as exemplified by Ann Whitefield. The half dozen other characters are sharply drawn: Octavius, the lover for love's sake; his sister, Violet, who conducts her love affairs on business principles; Hector Malone, the straightforward young American who sees only black and white; his millionaire father, hard-headed and soft-hearted; Roebuck Ramsden, orthodox Philistine; Mrs. Whitefield, the helpless and bewildered mother, and, best of all, 'Enry Straker, chauffeur and "New Man." The dialogue is Shaw at his best and there are no long monologues as the strictly philosophical discussion of the theme is segregated in the third act of which Shaw himself says — again in the preface — "I have . . . thrust into my perfectly modern three-act play a totally extraneous act in which my hero, enchanted by the air of the Sierra, has a dream in which his Mozartian ancestor appears and philosophizes at great length in a Shavio-Socratic dialogue with the lady, the statue and the devil."

By many critics 'Man and Superman' is regarded as Shaw's most important play since it combines some of his most cherished philosophical and social theories with the elements of popular success. It has been customary to identify Shaw himself with the character and opinions of Tanner, and Granville Barker, who played the part in the original production, was actually made up to resemble Shaw who, however, asserts that he had a certain popular Socialist orator in mind as Tanner's prototype. The play was first produced in May 1905, under the direction of Vedrenne and Barker, at the Court Theatre, London, where so many other Shaw plays have been introduced to the public. Its first American production was in September of the same year at the Hudson Theatre in New York with Robert Lorraine as director and also playing the part of Tanner. In the acting version the Don Juan interlude is always omitted but it has been given separately at the Court Theatre in London. For critical reference see bibliography given in article on CANDIDA; also Dickinson, Thomas H., 'The Contemporary Drama of England.'

MAN-OF-WAR, an armed naval vessel regularly employed in the service of a government for war purposes.

MAN-OF-WAR HAWK, or **FRIGATE-BIRD,** a tropical web-footed bird (*Fregata aquila*), of the family *Pelecanidæ*. The color of the adult bird is shining black, glossed with green, the female being duller in hue. Including the long tail the male bird reaches three feet in length, but the body is extremely small. The bill is longer than the head, strong, hooked at the point and sharp. In proportion to their size their wings are longer than in any other bird and have an extent of seven feet or more. Their flight is so powerful that they are seen more than a thousand miles from shore. They move with great difficulty on land, and rarely alight on the water. Possessing great strength and superior power of wing, the frigate-bird pursues terns or gulls which have secured a fish, and by beating them with wings and beak forces them to drop or disgorge it; then seizes the prey before it reaches the water. It also catches flying-fish for itself. Its usual locality for breeding is the summit of some rocky cliff, but breeds among trees where there are no rocky shores, making a rough platform of sticks. There is only one chalky white egg. This species is found throughout the tropics

and a second species (*F. minor*) ranges about the Indian and South Pacific oceans.

MAN-YOSHU, män-yō-shoo', or **MANY-OSHIU** (Japanese, COLLECTION OF ONE THOUSAND LEAVES), Japanese anthology, the most ancient in the language. It is believed to have been completed early in the 9th century; it comprises about 4,000 poems which form a valuable index to the history, customs and literary attainments of the time. Among its hundreds of authors the most able are Hitomaro and Akahito. The poems form a record of about 130 years, covering the latter part of the 7th and the early part of the 8th centuries.

MANACLE ROCKS, England, a dangerous reef on the south coast of Cornwall, not far from Lizard Head and seven and one-half miles from the town of Falmouth. They are barely visible, except at low water, and there is no warning of their presence to the mariner except a bell buoy. Many wrecks have occurred here.

MANAGER, City. See CITY MANAGER, PLAN OF GOVERNMENT.

MANAGUA, mä-nä'gwä, Nicaragua, (1) the capital of the state, near the southwest shore of Lake Managua, 32 miles south-southwest of Leon, consists of long rows of huts, and a large square lined with houses of two stories. The centre of the square is occupied by a large church, and there is another large church with a conspicuous white arched portal. The inhabitants, chiefly Indians, are industrious. A railway connects Managua with Corinto on the Pacific. Pop. about 30,000; (2) the lake, about 38 miles long, discharges itself into that of Nicaragua, above which it has an elevation of 16 feet, while its elevation above the Pacific is 156 feet. It has attracted a good deal of attention in connection with a proposed navigable communication between the Atlantic and Pacific.

MANAKINS, a rather undefined group of South American tropical birds, mostly of the family *Pipradæ*, related to the North American tyrant-flycatchers. They are small, brightly colored (but the females are usually much plainer than the males), and the wings often bear curiously modified and often highly ornamental feathers. They are of terrestrial habits, staying upon or near the ground in wooded places, clinging to herbs and twigs of bushes like chickadees, and subsisting upon insects largely caught on the wing. Some of the species, called «dansadors» in Brazil, gather in little parties in the breeding season, and go through queer active motions, called dancing. Consult Evans, 'Birds' (1900).

MANAOAG, mä-nä'wäg, Philippines, a pueblo of the province of Pangasinán, Luzon, situated on the Malabolo River, 18 miles east of Lingayén, an important road centre. Pop. 16,700.

MANAOS, mä-nä'oos, Brazil, city and capital of the state of Amazonas, on the Rio Negro, 12 miles above its confluence with the Amazon. A whitewashed cathedral rises in the centre of the town, which also has a custom-house, a small fort and a military barracks and hospital. The city is a steamboat station, and has a considerable trade in various forest products, but principally in india-rubber. Pop. about 20,000.

MANAR, mä-när,' or **MANAAR, Gulf of,** southern India, an ocean inlet between Ceylon and the Madras coast with an extreme width of 150 miles. It is almost closed at Palk Strait on the north by Adam's Bridge, a low reef of rocks and islands. The gulf has celebrated pearl fisheries.

MANASAROWAR, mä-nä-sä-rō-wär'. Tibet, a sacred lake and pilgrimage resort north of the main Himalayan range, near Darchan, between the sources of the Brahmaputra and the Indus. It is almost circular in form, about 15 miles in diameter. Another lake in the same locality is the source of the Indus.

MANASSAS, mą-nă'ąs, Va., town and county-seat in Prince William County, near a creek named Bull Run, on the Chesapeake and Ohio and the Southern railroads. It is about 35 miles southwest of Washington. Eastern College and the Manassas Industrial School are located here. The electric-lighting plant, sewage system and water-supply system are the property of the municipality. Twice during the Civil War Manassas was the scene of engagements. Pop. 1,217. See BULL RUN, BATTLE OF.

MANASSAS, First and Second Battles of. See BULL RUN.

MANASSAS GAP, Engagement of. General Lee, in retreating from Gettysburg, crossed the Potomac at Williamsport, into the Shenandoah Valley, and 15 July 1863 marched to Bunker Hill, and occupied the gaps of the Blue Ridge. On 19 July he ordered Longstreet to march next morning to Culpeper Court House, by way of Front Royal and Chester Gap. General Meade crossed the Potomac at Harper's Ferry and Berlin, on the 17th and 18th, and moved up the Loudoun Valley along the eastern side of the Blue Ridge; and on the 21st Merritt's brigade of Buford's cavalry division, pushing well up into Manassas Gap, skirmished with the 17th Virginia Infantry, and took 20 prisoners, from whom it was ascertained that Lee was moving up the valley with the evident intention of passing to the east of the Blue Ridge. Meade ordered the Third, Fifth and Second corps to march upon Manassas Gap, directing General French, commanding the Third corps, then guarding Ashby's Gap, to hasten to Buford's support. Before dark of the 22d French reached Piedmont, and Birney's division was pushed forward to Buford's aid followed by the remainder of the corps, and at daylight of the 23d entered the Gap and relieved Merritt's cavalry, which moved up to Chester's Gap. Meanwhile, at dawn of the 23d Hood's division of Longstreet's corps had marched from Front Royal and, relieving the 17th Virginia, was deployed in the Gap where it was relieved during the morning by Wright's brigade of about 600 men of R. H. Anderson's division, under orders to hold the Gap until relieved by Ewell, then marching from Winchester. Wright's brigade was deployed at the west end of the Gap, and Rodes' division, with two batteries of artillery, coming to its support, drew up about 600 yards in rear, and sent 250 sharpshooters to take position on its left. These dispositions were completed about 2 P.M. Meanwhile Birney's division had advanced, steadily driving in the Confederate outposts and from Wapping Heights beyond which

was Wright's line. About 4 P.M. Spinola's Excelsior bigade and two regiments of Ward's went forward at a charge and, sweeping past Wapping Heights, engaged Wright's men in a close and severe fight, driving them back upon Rodes, who stood firm, the artillery checking the Union advance about dark, Rodes' line not being engaged, and losing but 15 killed and wounded. Wright's loss was 19 killed, 83 wounded and 66 missing. French's loss was 21 killed and 84 wounded. Ewell fell back to Front Royal during the night. Next morning the Union advance marched to Front Royal, but all of Lee's army had passed and, marching swiftly through Chester and Thornston's gaps it took position on the south side of the Rappahannock. Consult 'Official Records' (Vol. XXVII); Humphreys, 'From Gettysburg to the Rapidan.'

MANASSEH, the older but less important of the two sons of Joseph, whose name is derived from the word "to forget," and explained as signifying "he who causes one to forget," that is "all my toil." (Gen. xii, 51). Although in Jacob's blessings, he was made subordinate to his younger brother, Ephraim (Gen. xlviii, 14), he was to be protected by the redeeming angel and to become a great people (Gen. xlviii, 16, 19). As the next verse reads, "in thee shall Israel bless, saying God make thee as Ephraim and Manasseh," the phrase forms the benediction which Jewish parents utter over their sons on the eves of Sabbaths and holidays. The name is held by one of the tribes of Israel, to which was allotted a position in the land of Canaan. It was the sixth in numerical strength (Num. xxvi, 34). During the journey through the desert of Sinai, its station was with Ephraim and Benjamin west of the Tabernacle, and it took a prominent part in the battle and later Israel's strongest chiefs, Gideon and Jephthah, belonged to Manasseh. Its territory was situated on both sides of the Jordan. With the centuries, the tribe fell behind Ephraim in power and prominence, and like Reuben and Gad it carried assimilation so far that it lost its identity, as it practised the idolatries of the people among whom it lived.

MANASSEH, king of Judah, Hezekiah's successor, boy of 12 on his father's death (2 Kings xxi, 1), and reigning 53 years. In the inscriptions of Assyria, he is mentioned as a vassal king during the reigns of Esarhaddon and Assurbanipal, who were aggressive monarchs, plundered Egypt and Phœnicia as well. Further light is thrown on the calamitous rule of Manasseh by the statement (2 Chron. xxxiii, 11) that the Assyrian captains took him in chains to Babylon, as punishment for Judah's disloyalty to God. On his repentance, however, he regained his throne and showed a genuine religious spirit which gave a new character to his nation. Ezekiel in a memorable chapter (viii) describes the spread of religion during Manasseh's reign and how the popular worship was a shameless blend of foreign idolatries, the influence of which was not quickly overcome, and against which the prophets declaimed at the peril of their lives. A prayer in Greek attributed to Manasseh, when captive in Babylon, is found in the Apocrypha, but never recognized as canonical by the Church. Jewish tradition makes no reference to it. Late critics claim that the prayer was originally in Hebrew.

MANASSEH, son of Johanan, the high priest and brother of Jaddua, and who married Sanballat's daughter. In Nehemiah (xii, 28) he is referred to without name, and he is further declared as having been deposed from the priesthood on account of being Sanballat's son-in-law. In Josephus (Antiq. xi, 8, 2-4), a fuller account is given. Incensed at Manasseh s marriage with a foreign woman, his brother Jaddua, the high priest, placed before him the alternative of divorcing his wife or giving up the priesthood. When he went to Sanballat and frankly declared his preference for the priesthood, despite his love for his wife, his father-in-law assured him if he would retain his wife that the king would give him the rank of high priest. Sanballat added that when he built with the king's approval a temple on Mount Gerizim, Manasseh should be its high priest. Hence he remained with his father-in-law, and became high priest in the Samaritan temple on Gerizim. A conflicting passage in Josephus (Antiq. xii, 4, 1) mentions Manasseh as high priest at Jerusalem between the priesthood of his nephew Eleazar and that of Onias II.

MANASSEH BEN ISRAEL, Hebrew scholar: b. La Rochelle, 1604; d. Middleburg, Netherlands, 26 Nov. 1657. His parents had resided at Lisbon but persecution rendered it prudent for them to remove to the north, and after a comparatively brief sojourn at La Rochelle, the family settled in Amsterdam, where the subject of this sketch was educated. In 1620 he became rabbi of the congregation Neveh Shalom of Amsterdam, and soon became a noted preacher. He started the first Hebrew press in Holland in 1627, published a prayer-book, a Hebrew grammar and an edition of the Mishnah. In 1632 appeared the first volume of his great work, 'El Conciliador,' a commentary and discussion of the discordant passages of the Old Testament. This work, written in Spanish, brought Manasseh great fame among the learned of his time and he maintained a correspondence with Grotius, Bartaeus and others. He sought the readmission of Jews to England but although favored by Cromwell his project did not receive the approval of Parliament. Other works from his pen are 'Hope of Israel' (1650); 'Pedro Glorioso' (1655); 'Vindiciæ Judæorum' (London 1656); 'De la fragilidad humana'; 'Thesoro dos Dinim,' etc.

MANATEE, an aquatic mammal or "sea-cow" of the order *Sirenia* (q.v., for general structure), several species of which inhabit the fresh waters along the eastern coasts of tropical America and of western Africa. The body is somewhat seal-like in shape, reaches a length of 8 or 10 feet, has a large round head with bristly, tumid lips, no apparent neck, no external ears, the forelimbs converted into paddles, no hind limbs, and the tail spade-shaped, like that of a beaver. The thick wrinkled skin is blackish, and almost hairless, but a coat of short, seal-like fur clothes the fœtus, indicating descent from furry ancestors. Structurally the manatee differs from other sirenians in having only six cervical vertebræ, and in the large number of molar teeth, which apparently go on increasing indefinitely during the animal's life,—the suggestion being, as Beddard points out, that

they are worn away by the attrition resulting from so much sand being mixed with the daily food. The cleft lip to be mentioned hereafter is also a generic peculiarity. The manatees are stupid, gentle, defenseless and harmless creatures, showing great affection for their young, one or two in number, which are nursed at pectoral udders, often while the mother stands erect upon her tail enfolding the "calves" with her broad arms. They never come ashore, but secrete themselves amid aquatic vegetation, where the only enemies they need fear are the larger alligators and the jaguar. Their food consists of fresh-water weeds and their roots, and these are procured by means of the curious form of the upper lip: "this is split in two, and the two halves, which are furnished with strong bristles, can play upon each other like the points of a pair of forceps." This cleft-lip is only suggested in the case of the dugong, but the fœtus of that animal shows the structure plainly, indicating that the manatee is the more primitive form of the two. The flesh is excellent for food. The American manatees have been nearly exterminated. They formerly abounded in the Indian River and other marshy waters about southern Florida, but by the end of the 19th century had been reduced to a small, carefully protected band near Biscayne Bay in the Miami River. They still survive in small numbers along the coast of the Carribean Sea and about the mouths of the Orinocco. The Florida manatee is called by American zoologists *Manatus latirostris,* and is regarded as different from those of Central and South America, long known as *M. americanus.* The African species is *M. senegalensis.* Consult Beddard, 'Mammals' (1901); Alston, 'Biologia Centrali-Americana' (1875); 'Standard Natural History' (Vol. V, 1885); Townsend, C. H., 'Notes on the Manatee' (in New York Zoological Society's Eighth Annual Report, New York 1904).

MANAYUNK, măn-ą-yŭnk'. See PHILADELPHIA.

MANBY, George William, English inventor: b. Denver, Norfolk, 28 Nov. 1765; d. Southtown, Great Yarmouth, 18 Nov. 1854. He was educated at the military college of Woolwich, and became in 1803 barrack master at Great Yarmouth. His attention having been drawn to calamities resulting in cases of shipwreck, from the difficulty of establishing communication with the shore, he attempted casting a rope from the shore to the wreck by the agency of gunpowder. Chains were unable to stand the shock of the discharge, but stout strips of rawhide closely plaited together were found to answer, and on 12 Feb. 1808 the entire crew of the brig *Elizabeth,* wrecked within 150 yards of the beach, were rescued by the simple contrivance of Captain Manby. In 1810 his invention was brought before a committee of the House of Commons, and having been favorably reported on, he received a grant of money, and all the dangerous stations on the British coasts were supplied with his apparatus. He also contrived shells filled with luminous matter, to enable the crew to perceive the approach of the rope, in the manufacture of which he suggested several improvements.

MANCHESTER, Conn., town, in Hartford County, on the Hockanum River, and on the New York, New Haven and Hartford Railroad (formerly New England Railroad), about eight miles east of Hartford. Until 1823, when it was incorporated as Manchester, it formed a part of East Hartford; it includes the villages of Highland Park, Buckland, Manchester, Manchester Green and South Manchester. The town has extensive manufacturing plants, the most important being the Cheney Silk Mills. It has also cotton and woolen mills, paper mills, needle works, soap works and electrical supply works. A large amount of tinware is made in Manchester. There are two public libraries, one in the village of Manchester and one in South Manchester. The town was reincorporated in 1907 and the government is after the commission model, seven men being elected as supervisors. Pop. 14,935.

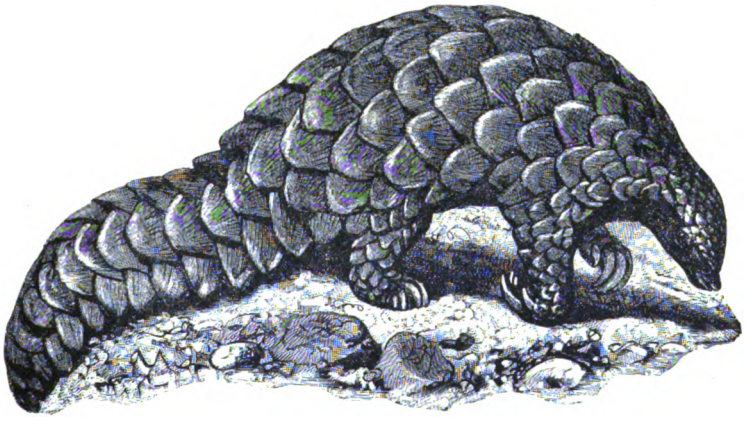
MANCHESTER, England, an episcopal and university city, inland port and Parliamentary and county borough of Lancashire, 188 miles north of London and 31 miles east of Liverpool, on the Irwell, an affluent of the Mersey, since 1894 connected with the sea at Eastham, on the Mersey, by the Manchester Ship Canal, 35½ miles long. It is one of the principal manufacturing cities of the world and the cotton trade centre of Great Britain. It covers over 21,645 acres. Railways and electric street tramways communicate with the surrounding towns and villages of the most populous industrial region of England.

Geology.— Manchester is built on a large plain, within easy distance of breezy hills and moorland, which are clearly visible from the outskirts of the city. The surface of the ground is composed of thick deposits of glacial drift — boulder clay, sands and gravels — beneath which are Triassic, Permian and Carboniferous rocks. Rich coal-fields are found in the neighboring parts, some of which extend under a portion of the city.

Industries and Finances.— Though Manchester is the chief seat of the cotton trade, it is no longer that of its manufacture, much of that industry being carried on in towns and villages beyond its borders. A considerable number, however, remain of cotton mills, print works, dyeing and bleaching concerns and factories concerned with other branches of textile manufacture. Engineering and machinery works are exceedingly numerous, as are the manufactories of electrical appliances. It is calculated that there are about 700 different industries carried on here, some of the chief among them, apart from those named above, being chemical, india rubber, paper and glass works. The membership of the Royal Exchange is over 7,000 and the Grocery Exchange about 3,000. There are also stock, corn, provision, coal and cotton-waste exchanges. The vegetable and fruit market serves for the whole of South Lancashire and part of Cheshire, while the fish market is second only to Billingsgate. There are nearly a score of banks, with numerous branches. The business of the post office exceeds that of any other out of London.

Bridges and Railway Terminals.— The bridges are of no engineering importance, as the Irwell is here but a narrow river. The terminal railway stations are six in number. (1) London Road, 1842, rebuilt 1881; (2) Victoria, 1844, since greatly enlarged; (3) Oxford

1



2

1 West Indian Manatee

2 Short-tailed Indian Manis

Road; (4) Central, 1877, near which the Midland Railway Company have erected a great hotel; (5) Exchange, 1884; (6) Deansgate, 1898, for the goods traffic of the Great Northern Railway. The oldest railway station in the world is still to be seen in Liverpool Road, though not used for its original purpose. It was opened in 1830.

Buildings.— The principal public building is the town-hall, commenced in 1868 and completed in 1877, at a cost, including land, of upwards of a million pounds. It covers an area of 8,648 square yards. The clock-tower is 286 feet high and contains a peal of 21 bells. In the great hall is a series of frescoes by Ford Madox Brown, illustrating incidents in the history of Manchester. The old town-hall, erected in 1825, is now occupied as a Free Reference Library. It is a classical building, and another of the same style and period is the City Art Gallery, formerly known as the Royal Institution. The Royal Infirmary, which originated in 1752, is situated in one of the finest positions in the centre of the community, but has been removed to an exclusive new building on a site on the outskirts. The Free Trade Hall (1856), built in the Italian style, will hold 5,000 people and has been the scene of many great political meetings and of the renowned concerts conducted by Sir Charles Hallé and Dr. Hans Richter. In a similar style is the Royal Exchange (1868–74), one of the most spacious erections of its kind. The area of the great hall is 5,170 square yards. The Assize Courts by Alfred Waterhouse, the architect of the town-hall, were built in 1864, at a cost of £100,000. Immediately to their rear is the county jail. The university buildings are also by Waterhouse. The John Rylands Library, by Basil Champneys, is perhaps the chief architectural gem of the city. Other examples of street architecture worthy of attention are the City Police Courts, the Corn Exchange, the Inland Revenue Offices, the Post Office, new Fire Brigade Station, Reform and Conservative clubs, and many of the banks, insurance offices and warehouses. The Municipal School of Technology is one of the most striking examples anywhere of a well-equipped school in an imposing building.

Educational Institutions.—Manchester University (q.v.) was reconstructed as an independent corporation in 1903. It was originally founded as the Victoria University in 1880, with a federation of the Owens College, Manchester, and the University College, Liverpool, as its colleges, to which the Yorkshire College at Leeds was afterward added; but in 1903 a separate university charter was granted to each city. The Owens College, which has now been incorporated with the university, was founded in 1850 by the aid of nearly £100,000 left by Mr. John Owens. It began work in a large house formerly occupied by Richard Cobden and was removed to the present fine buildings in 1873. Since then the Museum, Christie Library, medical school, physiological and other laboratories and the Whitworth Hall have been added and the institution has benefited from many large gifts and bequests. The splendid Municipal School of Technology is affiliated to the university, and the subjects in the faculty of technology are taken there. The faculty of theology was instituted in 1904, and the co-operation of the various theological colleges was obtained. These include Baptist, Free Methodist, Independent, Primitive Methodist, Roman Catholic, Unitarian and Wesleyan colleges. The oldest educational institution in the city is the Grammar School, founded by Bishop Hugh Oldham in 1515. It has now 1,070 scholars. Many distinguished names appear in the records of its alumni. Chetham's Hospital is named below. The following may be added: The Girls' High School, the Hulme Grammar School (founded by the Hulmean trustees), the Nicholls Hospital, Warehousemen and Clerks' School and the Royal Manchester College of Music, founded in 1893, as well as the numerous elementary and other schools.

Libraries.— Of libraries, the most recent, the John Rylands Library, is the most widely known, on account of its marvelous collection of rare and costly books and manuscripts. Its 100,000 volumes embrace the Althorp Library, purchased from Earl Spencer, and Lord Crawford's collection of manuscripts. It was founded and endowed by Mrs. Rylands in memory of her husband and was opened in 1899. The Chetham Library dates from 1656, from which time it has been open free to all, and is part of the foundation of Humphrey Chetham, the other part being a hospital or school for poor children. The Public Free libraries were established in 1852 and are supported by a public rate, which now yields over £35,000 a year. The chief or reference library contained (1913) 174,931 volumes and the 24 branch or lending libraries some 253,000 volumes. The Christie Library at the university was built by the late Mr. R. C. Christie, and on its shelves are the entire libraries of Mr. Christie, of Bishop Prince Lee, Prof. E. A. Freeman, in addition to other special and general collections. The Medical and Law libraries belong to the members of those professions, and there are other public and semi-public libraries of importance.

Art Galleries.— The City Art Gallery has been maintained by the corporation since 1882 and contains many fine examples of the British school, particularly works of Millais, Leighton, Holman Hunt, G. F. Watts and other modern artists. In this gallery, which formerly belonged to the Royal Institution, annual exhibitions have been held since 1827. The Manchester Academy of Fine Arts also holds its exhibitions here. Attached to the Municipal School of Art is a well-arranged art museum, and in the Whitworth Institute galleries in Whitworth Park will be found a rich collection of pictures, including a nearly complete series of specimens of the best English water colors, from those of Sandby, Girtin and Turner onward. The institute is one of many benefactions enjoyed by Manchester from money left by Sir Joseph Whitworth.

Churches.— When the diocese of Manchester was founded in 1847 the Collegiate Church became the cathedral. It is of unknown origin, but the present perpendicular Gothic building was raised, on an earlier foundation, about 1422. A large part has been rebuilt, mainly on the old lines, in recent years, yet many interesting portions of the earlier building remain. The ancient stalls in their choir have exquisitely carved canopies. The ancient parish consisted of 29 townships, including Salford, and some of them had chapels

of their own. In 1850 the ancient parish was divided into independent parishes by Act of Parliament. Next to the cathedral the oldest church is Saint Ann's (1712), which contains some beautiful windows by F. G. Shields. Many of the 19th century churches are of considerable pretensions. Besides 91 belonging to the Church of England there are 28 Roman Catholic churches and many others belonging to various sects. The Jews have 11 synagogues, and there is a Greek and an Armenian church.

Hospitals.— Hospitals to the number of 17, all maintained by voluntary subscription, are provided for the treatment of nearly every complaint to which the human frame is liable. The Royal Infirmary is the chief one. Saint Mary's Hospital and the Eye Hospital are others of large dimensions, while to the Hospital for Consumption is attached a sanatorium at Delamere in Cheshire, which was provided at a cost of £70,000 by a local benefactor (W. J. Crossley). In addition there are several dispensaries and asylums, and a large number of charitable institutions of various kinds.

Societies.— The literary and scientific societies are many in number and of high standing. The Chetham Society and the Record Society devote themselves to the publication of historical records of Lancashire and Cheshire. The Antiquarian Society (1883) has similar objects. The Literary and Philosophical Society was founded in 1781, the Literary Club in 1862, the Statistical Society in 1833, the Geological Society in 1839, the Geographical Society in 1884. These, as well as the Microscopical, and some other societies, all publish their transactions. Musical societies are numerous and vigorous, and the artists, architects, lawyers, doctors, accountants and men of other callings have their own societies.

Public Works, Parks, Etc.— The corporation is the owner of the waterworks that supply Manchester and Salford and some surrounding towns and villages. The water comes from Longdendale on the borders of Derbyshire and Thirlmere in Cumberland, and the works have cost over £8,000,000. The average quantity of water supplied per day is 38,000,000 gallons. The gas works have been the property of the corporation since the incorporation of the borough, and have always yielded a profit in aid of the rates. The supply of electricity is also a municipal undertaking. So also the fire brigade, public abattoirs, the foreign animal wharf on the Ship Canal, cold-air stores and the extensive sanitary works. The markets and the electric tramways are under municipal ownership. The city has many public parks, open spaces and playgrounds. The area of the largest (Heaton Park) is 662 acres and its cost was £220,000. The other municipal works include baths, cemeteries, workmen's dwellings, infectious diseases hospitals, libraries, art galleries, technical school and school of arts. The council is also the local education authority for the city. The construction of the Ship Canal involved an outlay of £15,000,000, one-third of which was lent by the corporation, who appoint 11 out of the 21 directors of the Ship Canal Company.

Government.— Since 1838 Manchester has been governed under the Municipal Corporations Acts and a long series of local statutes. The council consists of 144 members, 35 of whom are aldermen. The head of the council is styled lord mayor, that title being confered in 1893. The administration of the Poor Law is entrusted to three boards of guardians, for the Central and the North and South townships, and there are separate workhouses and other necessary establishments. There is a court of record for the trial of civil actions, established in 1838 and reconstituted in 1858, and now amalgamated with the court of record of the hundred of Salford, and since 1839 there has been a separate commission of the peace and separate quarter sessions. The Assize, County, Chancery and other law courts held in the city are not under local control.

History.— Manchester was in prehistoric times occupied by the Britons, as proved by urns and implements that have been unearthed, and abundant Roman relics bear evidence to a long period of Roman occupation. Little is known of the rule of the English or Saxons, but among other traditions is that of Queen Ethelbega, wife of Ina, king of Wessex, having lived here in 689, and of the Danes sacking the town in 863. In 923 King Edward the Elder, son of Alfred the Great, rebuilt and fortified Manchester. Manchester is mentioned in the Domesday Book, 1086, as possessing two churches, one of which is now conjectured to have been at Ashton-under-Lyne, originally in the parish. The barony of Manchester was held by the Gresleys, 1086 to 1313, and the last of that family granted a charter to his burgesses in 1301, and it was by this charter that the town was governed for over five centuries. The manor was afterward held by the De la Warres and the Wests until 1579, when it was sold to John Lacye, a London mercer, for £3,000, who in turn disposed of it in 1596 for a profit of £500 to Sir Nicholas Mosley, a Manchester man who had become a prosperous London merchant, destined to fill the office of lord mayor three years after his purchase of the manor. In his family the manor remained until 1845, when the whole of the manorial rights were purchased by the corporation for £200,000. One of the lords of Manchester, Thomas la Warre, entered the priesthood, became rector of the parish and in 1421 provided the means for collegiating the church, and gave his manor-house as a residence for the clergy of the college. This house, now known as Chetham's Hospital, is, apart from the church, almost the sole architectural relic of feudal Manchester. After the Reformation the building was confiscated by the Crown, and in the reign of Edward VI passed by purchase to the Earl of Derby. In his family it remained until the Commonwealth, when it was sequestered by the Parliament, with other possessions of the royalist Earl of Derby. In 1656 it was purchased by the executors of Humphrey Chetham and turned to its present uses. Manchester was visited in 1495 by Henry VII. It is unknown when the town began to be established as a trading and manufacturing centre, but it is clear from the Act of 1541 that a considerable commercial position had by that time been attained. Manchester holds an important position in the earlier history of the civil wars. At the outset the townsmen took the side of the Parliament, and made an effort to avert the conflict by presenting a petition to King Charles. The town was besieged by Lord Strange, who was repulsed. Prior to the actual

siege he demanded the delivery of the magazine, and in an affray which ensued a man was killed. This was on 15 July 1642, and the fatality was one of the first that occurred in the wars. The town was represented in Cromwell's first and second parliaments. In 1715 there were many Jacobites among the influential townsmen, and in the rising of 1745 the Young Pretender found numerous adherents here. Some of them, on the failure of the rebellion, were executed for their treason. The Duke of Bridgewater opened his canal from Worsley to Manchester in 1761, and the extension to Runcorn was completed in 1795. Distress, caused by the wars and high taxation, was a main cause of the political discontents which marked the first two decades of the 19th century, and are remembered by a weavers' riot in 1808, the "blanketeers" meetings in 1817 and the disastrous Peterloo affair of 1819, when, at a meeting to petition Parliament for the redress of grievances, several people were killed and many more injured during a charge of the military, after the reading of the Riot Act. The Manchester and Liverpool Railway was opened in 1830, marking a new era in internal communication. Manchester was enfranchised by the Reform Act of 1832, getting two members. (Under the redistribution of 1917, members are allocated to the city). The Anti-Corn Law League was established in 1839, and prosecuted a vigorous campaign throughout the country, culminating in the repeal of the Corn Laws in 1846. In 1847 the bishopric of Manchester was created and the collegiate church converted into a cathedral. Queen Victoria paid three visits to Manchester, the first in 1851, the second in 1857 and the last in 1894, when she opened the Ship Canal. The great Art Treasures Exhibition was held in 1857 and the Jubilee Exhibition in 1887. Both were remarkably successful, the latter yielding a profit of £43,300, which was devoted to public uses. From 1862 to 1865 there was great distress throughout the cotton manufacturing districts, owing to the American War; a relief fund of over $1,000,000 of money was raised on behalf of the operatives. The Ship Canal was projected in 1882 and opened in 1894. In March 1902 the city was visited by the Prince and Princess of Wales, who came to open the Whitworth Hall at Owens College; in July 1905 King Edward VII opened a new dock at the Ship Canal.

Population.— The population of Manchester is about 714,333. In 1841 it was 242,983; in 1871, 351,189; in 1891, 505,368; in 1901, 644,873. The great increase is partially accounted for by the extensions of the city boundaries which took place in 1885, 1890, 1904 and 1909.

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MANCHESTER, Iowa, city, county-seat of Delaware County, on the Maquoketa River and on the Illinois Central Railroad, about 130 miles northeast of Des Moines and 45 miles west of Dubuque. It is situated in an agricultural region and its excellent water power is utilized in manufacturing industries. The chief manufactures are woolen goods, tiles, brick, fencing, flour, wagons, carriages and dairy products. Manchester is the trade centre of a large part of Delaware and the adjoining counties, and ships farm produces, dairy products and livestock. A United States fish hatchery is in the vicinity. Pop. 2,758.

MANCHESTER, Mass., town, in Essex County, on Massachusetts Bay and on the Boston and Maine Railroad, about seven miles southwest of Gloucester. The first settlement was made in 1630, and until 1645 the place was called "Jefrey's Creek," when the name was changed to Manchester and the town was incorporated. Since 1845 Manchester has been a favorite summer resort, one of the attractions being a singing beach. In addition to good public schools the town has a free public library in the Coolidge Memorial. Pop. 3,000. Consult Lamson, 'History of the Town of Manchester.'

MANCHESTER, N. H., city, one of the county-seats of Hillsboro County, on the Merrimac River at the mouth of the Piscataquog and on branches of the Boston and Maine Railroad, about 17 miles south of Concord, the capital of the State, and 56 miles north of Boston. The first settlement was made in 1722 and for a number of years it was called Amoskeag and Harrytown. In 1751 it was incorporated as "Derryfield," and in 1810 the name was changed to Manchester. It was chartered as a city in 1846. The Amoskeag Falls (54 feet) in the Merrimac, above the city, provides extensive water power which by means of canals is made available for manufacturing. The city's prosperity is largely dependent upon this waterpower, which for years has been controlled by the Amoskeag Manufacturing Company. The city has over 400 manufactories, representing about 60 different industries. The capital invested is about $26,000,000 and the number of employees about 25,000. The chief industrial establishments are the cotton mills, which turn out annually about 250,000,000 yards of cotton. Other manufactures are foundry and machine-shop products (especially locomotives and fire-engines), hosiery, paper, boots and shoes, wooden-ware, needles, woolen goods, knit goods, leather, lumber, cigars, brushes, wagons, carriages and furniture. The system of waterworks, owned by the city, has a reservoir of 16,000,000 gallons capacity which is fed from Lake Massabesic, a body of pure water about four miles from the city. The works were completed in 1874 at a cost of $1,500,000. Some of the principal public buildings are the govern-

ment building, the Roman Catholic cathedral, the county courthouse, Sacred Heart Hospital, Hospital of Our Lady of Lourdes, Elliott Hospital, Women's Aid Home, Weston Observatory, Holy Angels' Convent and a public library, which contains about 46,000 volumes. The several public parks are well kept and add much to the attractive features of the city. The city has the State Industrial School, Saint Joseph's and Saint Patrick's orphanages and Saint Patrick's and Saint Vincent's homes for the aged. The educational institutions are a public high school, parish high schools, a number of grammar and elementary public and parish schools, a training-school for teachers, Saint Augustine's and Saint Mary's academies and Saint Anselm's College. The yearly income of the municipality is about $3,000,000. Pop. 75,635.

MANCHESTER, Va., a former city of Chesterfield County, on the James River and on the Atlantic Coast Line, the Seaboard Air Line and the Southern railroads. It is opposite Richmond, with which it is connected by several bridges. It is situated in an agricultural and coal region, and its industries are connected largely with the products of the farms and mines. At Manchester there is a fall in the James River of 100 feet in about six miles. The extensive water power is used for manufacturing in both Richmond and Manchester. Its chief manufacturing establishments are foundries, cotton mills, flour mills, woodenware factories, paper mills, glass works, brick yards and the repair shops of the Southern Railway. The city, with its population of nearly 10,000, was annexed to Richmond in 1906.

MANCHESTER, Vt., town, one of the county-seats of Bennington County, on the Battenkill River and on the Rutland Railroad, 32 miles south by west from Rutland. Manchester was one of the disputed places in the early days, when what is now Vermont was nearly all owned by New Hampshire, but a part by New York. The town of Manchester was incorporated in 1761 and the village in 1900. It is situated in a beautiful locality at the foot of Mount Equinox, which is 3,847 feet above the sea. The village is in a fertile farming section. An excellent quality of marble is found in the vicinity and the forests furnish a large amount of timber for several lumber mills. The water from mineral springs nearby is shipped to many parts of the country. Fishing-rods and ginger champagne are manufactured extensively. It is the seat of Burr and Burton Seminary and has the Mark Skinner Memorial Library, which contains about 21,000 volumes. Manchester has been a favorite summer resort for over 125 years, and for the past 60 years this business has been the largest single business in town and is steadily growing. Pop. 2,044. Consult Munson, 'The Early History of Manchester' (Manchester 1876).

MANCHESTER CANAL, England, a great ship canal, by which Manchester (q.v.), an inland town, was virtually converted into a seaport. See *Ship Canals*, under CANALS.

MANCHESTER UNIVERSITY. This university, officially styled the Victoria University of Manchester, has grown out of the Owens College, which was founded under the will of John Owens, a Manchester merchant who died in 1846, leaving £96,654 for the foundation of a college which should be free from religious tests. It was opened on 12 March 1851 in a house in Quay street, formerly the residence of Richard Cobden, with a staff of five professors and two teachers. It was originally governed by trustees under the founder's will, but by acts of Parliament, passed in 1870 and 1871, a new governing body was formed. The first principal was Mr. A. J. Scott, who resigned in 1857, and was followed by Dr. J. G. Greenwood, who held the office for 32 years. In 1889 Dr. A. W. Ward was appointed, at the end of 1897 he was succeeded by Dr. (now Sir Alfred) Hopkinson, Prof. F. E. Weiss in 1913 and Sir Henry A. Miers in 1915.

About 1870 a movement was started to provide a new site and buildings for the college and a fund of about £100,000 was raised. The new college in Oxford road, built from the designs of Mr. Alfred Waterhouse, was opened in 1873. Many subsequent additions have been made, including the medical school, the Beyer laboratories (natural history), the museum, the Whitworth engineering laboratory, the Schorlemmer laboratory (organic chemistry), the Christie Library, the physical laboratory, the Schunck chemical laboratory, the Whitworth Hall, the new engineering department, the John Morley chemical laboratories and the bacteriological laboratory in connection with the department of public health.

In 1872 the Manchester Royal School of Medicine was amalgamated with the college and has become a most important department, being now one of the greatest medical schools in the country. Frequent extensions have been made.

The library contains about 143,723 volumes and includes the entire collections of Dr. R. C. Christie, Dr. E. A. Freeman, Prof. Milnes Marshall and other eminent scholars. The library building was erected by the munificence of Dr. Christie, who had been professor of history in the college.

The museum building was erected in 1884–88. It originated in the gift of the collections of the Manchester Natural History Society and the Manchester Geological Society, together with the proceeds of the sale of their museum building. It is one of the completest and best arranged natural history museums in Great Britain. It is open free to the public and its management is vested in a committee of representatives of the city council and of the subscribers as well as of the university.

There are five halls of residence, three for men and two for women, for the benefit of students living at a distance from Manchester.

By the generosity of benefactors the students are provided with a gymnasium and a spacious athletic ground.

A striking instance of the popularity of the college was shown in 1902, when its jubilee was commemorated, by the raising of a fund of £102,500, out of which the debts of the college were paid and the general endowment increased.

The idea of elevating the college to the rank of a university was first broached in 1875 by Professors Greenwood, Morgan, Roscoe and Ward, but when memorials for a charter were in 1877 presented to the Privy Council, opposition was made by the Yorkshire College, Leeds,

and by other bodies in order to prevent a university charter being conferred on Owens College alone. It was finally agreed that the new university should bear the title of the Victoria University, and that while Owens College should be the first college of the university, yet provision should be made for the admission from time to time of other colleges. The royal charter creating the university was granted on 20 April 1880. University College, Liverpool, was admitted as the second college on 5 Nov. 1884, and the Yorkshire College as the third college on 3 Oct. 1887. It provided that the university should have its seat in Manchester and that the meetings of the university court and council and of the convocation should be held in that city. A subsequent charter, dated 20 March 1883, gave power to confer degrees in medicine and surgery.

A movement began in 1902 in Liverpool for the foundation of a separate university for that city, and thereupon the Owens College presented a petition for the reconstitution of the Victoria University as an independent university for Manchester. Both petitions met with favor by the Privy Council and the new charter of the Victoria University of Manchester was granted on 15 July 1903, and on 24 June 1904, an act for the incorporation of the Owens College with the university received the royal assent. Leeds obtained its own university charter on 25 April 1904.

Under the present constitution the authorities of the university are (1) the chancellor; (2) the vice-chancellor; (3) two pro-vice-chancellors; (4) the court of governors, which consists of 89 members; (5) the council, which is an executive body and consists of 24 members, including four representatives of the senate; (6) the senate, 50 members; (7) the board of faculties; (8) convocation, which now consists of 1,530 members.

The following are the various faculties: Arts (degrees B.A., M.A., Litt.D.); science, with a special department of education (degrees B.Sc., M.Sc., D.Sc.); law (degrees LL.B. and LL.D); music (degrees Mus.B. and Mus.D.); commerce (degrees B.Com. and M.Com.); theology (degrees B.D. and D.D.); technology (degrees B.Sc.Tech. and M.Sc. Tech.); medicine (degrees M.B., Ch.B.—i.e. bachelor of surgery—M.D. and Ch.M.). In the dental department there are degrees of B.D.S. and M.D.S., and in the department of public health diplomas are granted (D.P.H.) as well as D.V.S.M., ie., Diploma in Veterinary State Medicine.

There were 1,415 students in the several faculties of the university in 1914–15, marking a decrease from the previous year, owing to war conditions, of 25 per cent.

The capital of the university amounts to about £1,060,000, including £416,000 value of buildings, etc., and the annual income to over £60,000, derived from endowments, government grants, grants from the city of Manchester and other municipal bodies, and from fees.

MANCHURIA, măn-choo'rĭ-ą, China, comprises the northeasternmost portion of the empire, called by the Chinese TUNG SAN SHENG, "Three Eastern Provinces," from its administrative divisions, Hilung Kiang, the northern province; Kirin, the central province, and Sheng-King, the southern province. It lies mainly between lat. 40° and 53° N. and long. 118° and 135° E., and is separated from Asiatic Russia on the north and northeast by the Amur, on the east by the Usuri and on the northwest by the Argun. On the west it is bounded by Mongolia and China proper, part of the boundary being the Palisade Barrier, separating it from the province of Pe-chi-li; on the south the boundaries are the Liao-tung Gulf, the Strait of Pe-chi-li, Korea Bay, the Yalu River and Korea. The estimated area is 363,610 square miles. Vast chains of mountains ramify all over the country, one of them forming the south limits of the valley of the Amur. The principal rivers are the Amur; the Argun; the Sungari, the vast basin of which occupies a great part of the territory; the Usuri, like the Sungari, a tributary of the Amur; and the Liao-ho, flowing south into the Gulf of Liao-tung. The Nonni is an important southward-flowing tributary of the Sungari and the Hurka or Khurkha joins the same river from the south. The climate is in most parts healthful and invigorating. In the northern and more elevated parts the cold of winter is intense, the thermometer sometimes falling to 48° below zero and the snow lying for six months in the year. The summer temperature reaches about 90° in the shade. There are no roads in the modern sense of the word, transportation being best in winter on the frozen rivers.

The vast forests of the north are rich in useful timber of all kinds, such as walnut and oak, together with the soft pine and fir. They abound in wild animals, the tiger, panther, bear, wolf and stag, as well as the eagle and other birds of prey. The rivers abound with fish. The soil is exceedingly fertile, especially in the valleys of the Liao and Nonni rivers. In the summer the southern part looks to an American much like Illinois, and one may find on its most northern hills lilies-of-the-valley, pink peonies, white and yellow daisies and the fragile dog roses, as in Wisconsin and Minnesota. With the exception of four ice-locked months its fields are luxuriant with wheat, barley and millet, so that it has come to be called the "Garden of China."

It has one of the richest soils in the world and with the development of the Loya bean industry has grown more rapidly than any other Chinese province. Not one-fifth of the arable land is under cultivation. In the warmer portions the grape vine, indigo, cotton, opium, tobacco, sorghum, rice, ginseng, etc., are cultivated, the opium poppy being a valuable crop. The silkworm also is reared. The mineral wealth of Manchuria is great, but as yet is little developed. Iron, gold, silver, coal, peat, etc., occur in abundance. Not more than 10 per cent of the people of Manchuria are Manchus, Chinese forming 90 per cent of the population. The Manchus are a Tungusian race. They are of a lighter complexion and a more powerful build than the Chinese, have the same conformation of the eyelids, but their countenances are far more expressive and intellectual. In the 17th century they invaded China and placed their leader's son upon the throne. Since that time the Manchu dynasty has continued to reign in China, the Manchu language being the court and official language. Manchuria possesses a probable native population of 20,000,000, of whom 10,000,000 inhabit the

southern province of Sheng-King, 8,000,000 the central province of Kirin, and 2,000,000 the wild northern province of Hilung Kiang; but estimates of total population vary from 5,750,000 to 29,400,000. A great immigration from Russia, China, Korea and Japan took place especially after the Russian occupation in 1900. See CHINA.

For a considerable time prior to 1891, when the first sod was turned for the construction of the great Siberian Railroad, the Russian government was anxious to secure control of this territory. When Japan in 1895 occupied the Liao-Tung Peninsula of Manchuria and began to fortify Port Arthur as its southern tip, Russia, with two other powers protested. Weak, though victorious, Japan withdrew, shortly afterward to learn of the secret treaty of Count Cassini, by which Russia leased Port Arthur from China for 26 years. Having obtained this foothold, the Russians cast covetous eyes on the vast territory which lay between, and under the commanding influence of Admiral Alexieff, generalissimo of the Russian military and naval forces in the Far East, who, in 1903, for his services was proclaimed by imperial ukase viceroy of Greater Russia and lord of all the lands which lie between Baikal and the Pacific and which extend from the Arctic to the Yellow Sea, they accordingly began a pacific conquest by colonization on an unparalleled scale. The route of the Siberian Railroad was originally surveyed with Vladivostok on the Pacific coast of Russian Asia as the terminus. Port Arthur, however, washed by the warmer waters of the Yellow Sea, now became the coveted goal.

A corporation known as the Russo-Chinese Bank was established, which to all appearances was a mutual combination of Russian and Chinese capital, but was actually only another name for the Department of Finance of the Russian Empire.

There were times when China was short of ready cash, and the Russo-Chinese Bank each time went to her aid. Therefore, when China was asked to grant a concession for a railroad from the Siberian trunk line to Liao-Tung Bay, to be called the Russo-Chinese Railroad, and the Russo-Chinese Bank offered to furnish the necessary $250,000,000, China could not well refuse. This railroad penetrated the most fertile as well as the most densely populated districts of Manchuria and had as its terminus the Russian fortress of Port Arthur. On the north it joined with the Siberian trunk line at Harbin, on the mighty Sungara. It passed through the cities of Tsitsihar, Kirin and Mukden, capitals of the three Manchurian provinces. It tapped the Gulf of Liao-Tung, by means of the port of New-Chwang, and skirted the whole eastern coast of this arm of the Yellow Sea.

When the other powers became alarmed at the armies which kept pourning in from Siberia and European Russia, the officials of the Tsar pointed to a clause in the railroad's charter which permitted Russia to guard the railway with troops, but did not limit their number. There followed a vigorous colonization policy; free transportation (with a land grant of 100 acres to each male of a household, besides agricultural implements) was offered to Russian immigrants; and families migrated from all parts of the Tsar's western dominions. Notwithstanding this influx amounting to 200,000 a year, it did not penetrate far from the railroads. The region is too vast.

Consequent on the Boxer massacres and troubles of 1900 a Russian military force occupied the right bank of the Amur River, declared it to be Russian territory and established a provisional Russian administration. On 8 April 1902, the Manchurian convention between China and Russia was signed, wherein Russia agreed to evacuate Manchurian territory within 18 months. But Russia could not then voluntarily withdraw. The civilization of the Slav had rooted itself too firmly in this soil to be eradicated except by a political cyclone. One could see everywhere, from Port Arthur at its extreme southern end to the Amur River, the old Russian boundary, on the north, evidences of the Muscovite occupation. Under the direction of Russian engineers native laborers were building railroads and military highways, constructing wharves, marking out vast farms and laying out cities. The Russian fortress was found wherever a strategic site would make Russian cannon still more formidable, and almost in the shadow of these guns rose the peaceful sanctuaries of the Orthodox Greek, with their white walls and green roofs and cupolas.

For the purpose of supplying her thousands of colonists with a great seaport and commercial outlet, Russia had built the city of Dalny (q.v.), 14 miles from Port Arthur, on the eastern side of the Liao-Tung Peninsula.

The population grew rapidly, and the lines of steamships which load here directly from the cars of the Siberian Railroad increased in number and in frequency of service, while bids were received at Port Arthur by the Russian authorities for the construction of electric light plants and electric railways for Mukden, Harbin and New-Chwang.

On 8 Oct. 1903 the Russian government was pledged to evacuate Manchuria, yet when that day came she only poured in more soldiers and made a great naval demonstration, her actions creating international uneasiness for Japan and Great Britain from political as well as commercial motives, and for the United States on account of commercial rights obtained by the Shanghai treaty to trade freely with Manchuria, were particularly interested in ensuring the integrity of the Chinese Empire, its administrative control over its Manchurian provinces and the maintenance of the principle of the «open door.» Furthermore, Russia added to the trouble which was brewing over her continued occupation of Manchuria by opposing Japan in her refusal to allow Korea to open the port of Wi-ju to foreign trade, or to permit Japan to lay a telegraph line from Seoul to Fusan. Russia, moreover, obtained from the Korean government a timber-felling concession south of the Yalu, and also had a telegraph line in working order in Korean territory. Japan had great interests at stake. Russia in Manchuria was a constant menace to the independence of Korea, over the suzerainty of which Japan had successfully fought China in 1894–95. Japan, in assimilating all that was best of Occidental civilization, had learned all that was worth learning of European diplomacy, and by treaty revision and her correct attitude during the Chinese War by the Boxer troubles had raised herself and been admitted to the rank of a civilized world power.

Soon after Russia, with the aid of France and Germany, had secured a diplomatic victory over Japan in obliging her to withdraw from the Liao-Tung Peninsula, which she had occupide by right of conquest over China in 1894–95. Japan had effected a defensive and offensive alliance with Great Britain, whereby that power was pledged to intervene in any future conflict, should any third party again interfere with Japan's political arrangements. In July 1893, Japan had opened negotiations with the Russian government "with a view to a friendly definition of the interests of the two countries in Manchuria and Korea where those interests meet, and thereby to remove every cause of conflict between Japan and Russia." She now redoubled her efforts in that direction. Russia, it is alleged, unduly delayed her replies, or proposed such amendments as were altogether inconsistent with Japan's idea of an amicable settlement, thus making the situation more and more complicated. Besides, Russia made great naval and military preparations, dispatching all her most powerful war vessels to the extreme Orient and sending military reinforcements to Manchuria and the neighboring regions. Japan, believing further delay would increase her danger, broke off negotiations with Russia on 6 Feb. 1904. On the 9th, without any formal declaration, war was begun by Japan. (See JAPAN; RUSSO-JAPANESE WAR). By the Treaty of Portsmouth, signed 5 Sept. 1905, which concluded the war, the Russian lease of Port Arthur and Talien-wan, and the southern extremity of the Liao-Tung Peninsula and the South Manchurian Railway were transferred to Japan 22 Dec. 1905. China gave official sanction to the transfer and granted Japan the right to extend the railway from Mukden to Autung at the mouth of the Yalu River, where it joins with the Korean Railway. Since the war there has been noted a disposition on the part of Russia and Japan to work together. A proposal made on behalf of the United States by Philander C. Knox in 1909 for the neutralization of the Manchurian railways was met by co-operation between the old enemies. In 1913 there were 2,102 miles of railway: the Russian lines (Chinese Eastern Railway) extending to 1,075 miles, the Japanese (Southern Manchuria Railway) to 684 miles, and the Chinese (Northern Chinese Railway) to 514 miles. Extensions are being made, the most important being that projected by Russia in 1916, from Harbin directly across Manchuria to near the Russian frontier, with a branch to Tsitikar (662 miles). This railway would give control to Russia in northern Manchuria in return for rights already secured by Japan in southern Manchuria. Consult Christie, D., 'Thirty Years in Moukden' (London 1914); Hosie, A., 'Manchuria: Its Peoples, Resources and Recent History' (ib. 1901); Kemp, E. G., 'The Face of Manchuria, Korea and Russian Turkestan' (ib. 1912); Little, A., 'The Far East' (Oxford 1905); Pozdnuf, 'Manchuria' (Saint Petersburg 1897); Ross, J., 'The Manchus; or the Reigning Dynasty of China, their Rise and Progress' (London 1880); Weale, 'The Reshaping of the Far East' (ib. 1905); 'The Truce in the East and its Aftermath' (ib. 1907); 'The Commercial Struggle in the Far East' (ib. 1908).

MANCHUS, a Tartar people of Tungusic origin, descendants of the Jurchin or Niu-chi, who overran northern China in the 12th century and established the Kin or Golden dynasty, latter overturned by the Mongols, and of the tribes who followed Nurhachu (1559–1626) and his successors in his conquest of Liao-Tung and Liao-si, in the first half of the 17th century, who aided the Chinese general, Wu-san-kwei, in suppressing the rebel Li-tse-Ching, and who retained the country for themselves, establishing in 1643 the Ta-Tsing, or "Great Pure" dynasty which ruled China down to the establishment of the republic in 1912. They form a very small minority of the population of China to-day; they are a quiet, inoffensive people noted for their politeness. They now speak the Chinese language, their own tongue being well-nigh extinct. Physically they are rather tall, with mesocephalic head. The famed Chinese queue, but recently abolished, was introduced by the Manchus and was at first an insignia of the subjection of the Chinese to the Manchus. Buddhism in the Chinese form of to-day also dates from the Manchu conquest. For the history of their conquest and rule in China see CHINA, *History.* Consult Giles, 'China and the Manchus' (Cambridge 1912); Kent, P. H. B., 'The Passing of the Manchus' (London 1912); Ross, 'Manchus; or The Reigning Dynasty of China, their Rule and Progress' (London 1891).

MANCINI, măn-chē'nē, a name borne by the five nieces of Cardinal Mazarin. They were born in Rome and summoned by their uncle to Paris, where they played a conspicuous part in the court of Louis XIV during the early years of his reign. They were: (1) LAURE (b. 1636; d. 1657), the amiable and pious companion of Louis XIV's boyhood. She became the mother of Louis, Duke of Vendôme, one of the greatest generals of the Grand Monarque. (2) MARIE (b. 1639; d. about 1715), for whom the king conceived a violent affection, but in 1661 Mazarin gave her in marriage to Prince Colonna, constable of Naples. (3) OLYMPE (b. 1640; d. 1708), a witty and attractive woman, who became wife of Eugène de Savoie-Carignar, Count of Soissons, and mistress of the queen's household. (4) HORTENSE (b. 1646; d. 1699), the most attractive and beautiful of the Mancini. In 1666 she left her husband, the Duke de Mazarin, and became one of the chief beauties of King Charles II's court. The king pensioned her, and after the Revolution of 1688 she lived in retirement in Chelsea. (5) MARIE ANNE (b. 1649; d. 1714) was the wittiest and most vivacious of the sisters. In 1662 she married the Duke de Bouillon, and her salon became the centre of social and intellectual life at Paris. She patronized La Fontaine, Corneille and Molière. She died in Clichy. Consult Chatelauze, 'Louis XIV et Marie Mancini' (Paris 1880); Renée, 'Les nièces de Mazarin' (ib. 1856); Williams, A. N., 'Five Fair Sisters' (New York 1906).

MANCO INCA I, ĭng'ka, Peruvian ruler: b. about 1500; d. 1544. He was the second son of the inca Huayna Capac (q.v.), who died about 10 years after the first arrival of the Spaniards, dividing his kingdom between his legitimate successor, Huascar, and a younger son, Atahualpa. The latter, after having made war upon Huascar, and put him to death, was himself captured and executed in 1533 by Pi-

zarro. Shortly afterward Manco appeared in the Spanish camp to announce his pretensions to the throne and claim Pizarro's protection. The conqueror received him cordially, and made it his first care after the taking of Cuzco to place him on the throne. After in vain petitioning for power to exercise the sovereignty, he withdrew secretly from Cuzco, but was brought back and imprisoned. Again escaping, he roused the whole nation to arms against the invaders, and appeared before Cuzco (February 1536) with a countless host of Indians who covered the surrounding hills. He destroyed a large part of the city by fire and reduced the Spaniards to extremities; but after the siege had lasted over five months, had to withdraw on account of the scarcity of food. Defeated subsequently by Almagro and forsaken by most of his warriors, he fled to the Andes, and for several years maintained his independence, sallying forth as occasion offered at the head of a few brave followers, always eluding pursuit in the wilds of the Cordilleras, and in the event of civil war among the foreigners throwing his weight into the weaker scale in order to prolong their contests. He was killed by a party of Spaniards belonging to the younger Almagro's faction, who on the defeat of their leader had taken refuge in the Peruvian camp.

MANDÆANS, măn'dē'ănz, an ancient Oriental religious sect of mixed Christian, Jewish and heathen elements. They are still found on the east shore of the Tigris, working as jewelers, blacksmiths, carpenters, etc. Their religion is a kind of Gnosticism, retaining various Jewish and Parsee elements. They worship a number of personifications, particularly of the attributes or names of God. They publicly call themselves Sabians (*Subbâ,* "baptists"), thus professing to identify themselves with the Sabæans tolerated in the Koran. They were formerly called Christians of Saint John the Baptist from their habit of baptism or ablution. They have five important sacred books: 'Sidrâ rabbâ' ("the great book"), called also "ginza," "treasure"; 'Sidrâ de Yahyâ' ('Book of John'); the 'Qolasta,' a collection of hymns; 'Diwân,' a ritual; and 'Asfar Malwâsê,' a manual of astrology. The Mandæans had three degrees in the priesthood, with a supreme official (Rish ammâ) as the source of both civil and ecclesiastical authority. The priests officiate in white robes, barefooted, and women may be admitted to their order.

MANDAITES. See NAZARENES.

MANDALAY, măn'dạ-lā, East India, capital of Upper Burma, two miles from the left bank of the Irawadi, a little north of Amarapura (q.v.), the former capital, and about 410 miles north of Rangoon. It was founded in 1860, was the capital of independent Burma until its capture by the British in the end of 1885, and since the treaty by which (1886) the king lost his throne it has been the capital of Upper Burma. The area is six square miles. The most famous shrines in Mandalay are the Aracan Pagoda, containing brazen image of Buddha, 12 feet high, and the Kuthodaw Pagoda, 110 feet high, surrounded by 729 others, each inscribed with a part of the Buddhist scriptures. In the centre of the town stands what was once King Theebaw's palace. Outside the enclosures of the city was, until the British conquest, a crowded, dirty native town, now cleared away to make room for a British cantonment (Fort Dufferin). The present native quarters lie outside the fortified city. Beyond them, again, on the slopes of the hills that border the valley of the Irawadi, are numerous fine monasteries. The use of machinery is almost unknown; except for some rice and timber mills and brewing the industries are all conducted in the home. Silk weaving is the most important; some of the others are gold and silver work, ivory and wood carving, bell and gong casting, and knife and sword making. In 1886 and in March 1892 much damage was done by fire and by an inundation of the river. In 1886 a meteorological observatory was built. Kipling (q.v.) called special attention to this ancient city by his poem 'Mandalay.' Pop. 138,299.

MANDAMUS, *in law,* a writ issued by a superior court and directed to some inferior tribunal, or to some corporation or person exercising public authority, commanding the performance of some specified duty. In general practice in the United States a mandamus issues where a party has a right to have a thing done, and has no other remedy, and in some cases where he has another but a tedious and inadequate one; and must be applied for without delay. It is either in the alternative, ordering the court, corporation or party to which or whom it is directed to do the thing specified or to appear and show cause why it should not be done; or absolute, commanding the thing specified to be done without any condition or alternative. The writ is usually first issued in the alternative, and in case of there being no appearance, or no sufficient cause to the contrary being shown an absolute mandamus is issued. The cases enumerated for the issuing of this writ are — to compel the party applying to be restored to some office or franchise of a public nature, whether temporal or spiritual; for the production, inspection or delivery of public books and papers: to oblige bodies corporate to affix their common seal; or to compel the holding of a court. It may be directed to an inferior court, ordering it to proceed in the hearing of a cause, or to enter up a judgment. Consult Bailey, W. F., 'Treatise on the Law of Habeas Corpus and Special Remedies' (2 vols., Chicago 1913); Spelling, T. C., 'Treatise on Injunctions and Other Extraordinary Remedies' (2d ed., Boston 1901) and Wood, H. G., 'Treatise on the Legal Remedies of Mandamus and Prohibition' (3d ed., Albany 1896).

MANDAN, a tribe of American Indians of the Siouan family, the remnants of which number less than 300, are settled upon the Fort Berthold Reservation in North Dakota. In 1778 the Mandans occupied nine villages upon both sides of the Missouri River near Saint Louis, but wasted by smallpox and decreased by numerous battles with the Sioux, they removed further up the Missouri. In 1804 they were found by the Lewis and Clark Expedition (q.v.) occupying two villages at the mouth of the Knife River. In 1837 when a smallpox epidemic destroyed thousands of American Indians the Mandans were still further reduced in numbers from 1,700 to less than 400. In

1846 the remaining families of the tribe took up their residence at the Fort Berthold Reservation. The Mandans were not a nomadic people, but resembled the Pawnees, living in log houses with village administration and local government. They were an agricultural people, raising corn, tobacco and other crops.

MANDAN, N. Dak., city, county-seat of Morton County, on the Missouri River and on the Northern Pacific Railroad, about five miles above Bismarck. In the vicinity are extensive coal mines, and on the large ranches are raised cattle and sheep. Considerable wheat is cultivated on the farming lands. Nearby are a number of the ancient mounds somewhat similar to those in Ohio and other parts of the United States. The State Reform School and Indian schools are located here. The city is the headquarters of a railroad division and has large railroad shops. In 1907 the commission form of government was adopted. The waterworks are the property of the municipality. Pop. 3,873.

MANDARIN, the term usually applied in China by foreigners to government officials of every grade. It is supposed to be derived from the Portuguese *mandar,* to command, or from the Sanskrit *mantrin,* counsellor; the Chinese equivalent is *kwan,* which signifies literally a public character. There are nine ranks, distinguished by different buttons.

MANDARIN DUCK, a small Chinese duck (*Aix galericuta*) closely related to the American wood-duck (*A. sponsa*), and dressed in an exceedingly beautiful plumage of metallic green, purple, chestnut, white and black. It has long been domesticated by the Chinese, and as it is said to pair for life, is held up by them as a model of marital virtues; and it has been introduced upon park waters and ornamental grounds in America and Europe.

MANDAT, mäṅ-dä, the name given to a kind of paper-money in the French Revolution. After the assignats, which had been kept in circulation by the violence of Robespierre, had lost all credit, a new money was created — the mandats — founded, like the assignats on the credit derived from the confiscated property, but with the essential difference that specific pieces of property, enumerated in a table, were pledged for the redemption of the bills, while the assignats furnished only a general claim. These mandats were issued in accordance with the law of 1796, to the nominal value of $480,000,000. A forced circulation was given to them, by which the government was enabled to defray the expenses of the approaching campaign.

MANDATE, *in law,* a term derived from the Roman civil law. It may be defined as a bailment (delivery) of a chattel or chattels to a person who is to do something with or about the things bailed, entirely without compensation. The essential element of the contract lies in the fact that there is not paid or promised, in law or in fact, any compensation whatever for the service to be rendered. The person delivering the chattels is called a mandator; and the person receiving them and undertaking the service is called a mandatary. As it must be a service or an act, the whole benefit of which rests with the mandator, this, by the ordinary principles of bailment, determines the amount of care to which the mandatary is bound, and the degree of negligence for which he is answerable. For negligence in a bailee has in law three degrees: slight negligence, which makes the bailee responsible where the bailment was wholly for his benefit: ordinary negligence, for which he is responsible if the bailment be for the benefit of both parties; and gross negligence, for which only the bailee is responsible where the contract is for the exclusive benefit of the bailor. And as it is not a mandate if the bailee derives any benefit whatever from the service, it follows that a mandatary is responsible for loss of or for injury to the thing delivered to him, only when it is caused by his gross negligence. There is no especial form for the contract of mandate; it may be in writing or by word only, and made very solemnly or in the simplest way; in either case the law is the same. No man can be held in the United States for a breach of any promise, whether that breach be partial or total, if the promise rests upon no consideration. But if he who has made a promise, afterward does some injury to the promisee (and this would be the case if he does something which is positively injurious because it is not completed), he is liable for the injury he has caused, as he would be if there were no promise between the parties. Banks and bankers are so far mandataries, that they receive notes for collection, and render, or engage to render, by agreement or by mercantile usage, these and similar services without any especial or specific compensation. But it is understood that they do this as a part of their business, and for the general and indirect benefit they derive from doing it; and this is undoubtedly consideration enough to make them liable for any injury to their customer caused by their negligence; and it is sufficient to make them liable that their negligence was ordinary, or consisted in the want of common care. And a bank has, as bailee, a lien on its deposits for its general balance against the depositor.

MANDAUE, män-dä'wā, Philippines, a pueblo of the province of Cebú, situated on the east coast, on the north shore of Cebú Channel, five miles northeast of the town of Cebú; it is on the coast road. Rice-growing is the principal industry. Pop. 11,000.

MANDAYA, män-dä'yä, a Philippine tribe of the Malay race living in the commandancia of Bislig, and the district of Dávao, island of Mindanao. They are bloodthirsty and head-hunters, mostly heathen, though Jesuit missionaries have converted some to Christianity. (See PHILIPPINE ISLANDS). Consult Cole, F. C., 'Wild Tribes of Davao District, Mindanao' (in 'Field Museum Publication 170,' Chicago 1913).

MANDEL, män'dĕl, **Eduard,** German engraver: b. Berlin, 15 Feb. 1810; d. there, 20 Oct. 1882. He studied in Paris with Henriquel-Dupont, and in 1842 became professor of engraving at the Berlin Academy and director there after 1856. He was one of the greatest of modern German engravers, the most important work of his being the plate of Raphael's 'Madonna di San Sisto,' his latest effort. Other works are the plate after Hildebrandt's 'Warrior and Child' (1835); plate of Bega's

'Lorelei' (1837); Van Dyck's 'Portrait of Himself' (1841); 'Titian's Portrait of Himself' (1843); Van Dyck's 'Charles I' (1850); Raphael's 'Madonna Colonna' (1855); 'Frederick the Great'; 'Madonna della Sedia' (1865). Consult Pietsch, 'Eduard Mandel und seine Werke' (Berlin 1883).

MANDERSON, Charles Frederick, American lawyer and politician: b. Philadelphia, 9 Feb. 1837; d. 1911. He received his early education in Philadelphia, removed to Canton, Ohio, in 1856, studied law and was admitted to the bar in 1859. He was city attorney in Canton, 1860–61; at the outbreak of the Civil War he enlisted as a private in the Union army, served in the campaigns in the Middle West and rose through the intermediate grades to the rank of brigadier-general of volunteers. He was severely wounded at the battle of Lovejoy's Station, Ga., and resigned from the army in 1865 on account of his wounds. He resumed his law practice in Stark County, Ohio, but removed to Omaha, Neb., in 1869. Here he soon became prominent in public affairs, was city attorney for more than six years and a member of the Nebraska Constitutional Conventions in 1871 and 1874. In 1883 he was elected to the United States Senate, serving until 1895, and being chosen speaker pro tem in two Congresses, 1889–93. After 1895 he was solicitor for the Burlington system of railroads, west of the Mississippi; and was president of the American Bar Association in 1900–01. He published 'The Twin Seven Shooters' (1902), and several addresses on political and legal subjects.

MANDEVILLE, Bernard de, English writer: b. Dort, Holland, c. 1670; d. London, 21 Jan. 1732 or –33. He was educated at the Erasmus School, Rotterdam, and at the University of Leyden, where, in 1691, he received the degree of doctor of medicine. The date and occasion of his removal to England are unknown; but he appears soon to have settled in London where with but small success he practised his profession. He lived obscurely, with distillers and Dutch merchants as his ordinary acquaintances. Franklin, in his 'Autobiography,' records that in 1725, at "the Horns, a pale-ale house in —— Lane, Cheapside," he was introduced "to Dr. Mandeville, author of the 'Fable of the Bees,' who had a club there, of which he was the soul, being a most facetious, entertaining companion." Franklin at this time was merely a struggling young printer, unknown to fame: Mandeville gained no honor from his acquaintance. Mandeville had, however, a few acquaintances outside his tavern circle. Of these, the most important was Lord Macclesfield, the chief justice, at whose house Mandeville also met Addison. Of their world, however, Mandeville was never a real part, socially or intellectually.

Mandeville wrote much both in verse and prose; but his chief claim to notoriety was the authorship of the 'Fable of the Bees.' This, in its earliest form, consisted solely of a rude poem, in octo-syllabic couplets far from Miltonian, entitled, 'The Grumbling Hive, or Knaves turned honest.' In it, he related how, so long as they remained unscrupulous, the bees increased in numbers and prosperity, and how by their moral reformation the bees gained only their material ruin. He concluded that

> "To enjoy the world's conveniences,
> Be famed in war, yet live in ease,
> Without great vices is a vain
> Utopia, seated in the brain.
> Fraud, Luxury, and Pride must live,
> While we the benefits receive."

Of this piece, the earliest known edition is that of 1705. Mandeville's assertion that an earlier edition was printed is unsupported by evidence. In 1714, Mandeville reprinted the poem with prose additions, the whole bearing the new title 'The Fable of the Bees, or Private Vices Public Benefits.' This he further enlarged in the edition of 1723.

At this point, the grand jury of Middlesex interfered, and, in July 1723, presented the 'Fable' as a nuisance. Immediately the book became a subject of general attack. Richard Fiddes and John Dennis in 1724, William Law, Francis Hutcheson in 1725–27, Archibald Campbell in 1728 and Bishop Berkeley in 1732, all assailed Mandeville in turn. By Law and by Berkeley, Mandeville was intellectually outclassed; but he held up his side of the argument, adding to his 'Fable,' in successive editions, tract after tract. That the 'Fable' should be thus attacked is not surprising. Its fundamental thesis, that private vices are public benefits, was as subversive of morality as its illustrative material was foul and its style plausible and forceful. Whether Mandeville was sincere or ironical in his argument is in dispute. That he thoroughly enjoyed his own foulness cannot be doubted. But at least he accomplished one good thing; he pricked the sham morality of Shaftesbury. Other works by Mandeville are 'Esop Dressed, or a Collection of Fables Writ in Familiar Verses' (1704); 'Free Thoughts on Religion' (1720); 'Enquiry into the Causes of the Frequent Executions at Tyburn' (1725). Consult Robertson, J. M., 'Pioneer Humanists' (London 1907).

MANDEVILLE, Sir John. The alleged author of a mediæval book of travels which enjoyed great popularity. A large number of manuscripts are in existence, the most important of which are in Latin, French and English. The earliest version is in French, dating from the latter part of the 14th century, and upon this all the others appear to be more or less directly based. There is no English manuscript antedating the 15th century. The statements in the prologue regarding the translation are to be distrusted, and the autobiographical matter is contradictory. An exaggerated importance has sometimes been attached to the compiler of the work as the father of English prose, because of the statement in one of the English manuscripts that he had translated it out of French into English in order that every man of his nation might understand it. Errors in the translation prove that the man who wrote the French version and the man who made the English rendering cannot have been one and the same person.

The travels consist, in the main, of an account of the Holy Land and the routes thither, followed by a description of various parts of Asia. The narrative is almost wholly spurious, being made up of paraphrases and borrowing from various sources — travel-books, bestiaries, works on Eastern manners, legends, romances,

etc. The first half of the book is chiefly dependent upon the travels of William of Boldensele, a German who flourished in the 14th century, and the second part upon the work of Friar Odoric of Pordenone (about 1330). The only portions which may reflect personal experience are those dealing with Jerusalem and Egypt, which it is not impossible that the compiler may have visited. The story abounds in all kinds of adventures and marvels, related with an air of sober truth. There are accounts of monsters and curiously misshapen men, of regions haunted by devils, of the Fountain of Youth, of the Phœnix, of the realm of Prester John, etc. The narrator must have been a man of wide reading, and he certainly displays considerable skill in the selection and arrangement of his materials.

In the prologue the author states that his name is "John Maundeville, knyght," b. at Saint Albans, England, and that he "passed the see," in 1322 (1332), whereupon he traveled through various countries. The epilogue asserts that the gout forced him to return, and that he occupied his leisure in writing his experiences. It has been found impossible to identify him with any historical John Mandeville.

The tomb of the reputed author of the 'Travels' was long shown at Liège, with an inscription to "Joannes de Mandeville, alias dictus ad barbam." Important in this connection is the testimony of one Jean d'Outremeuse, in a 'Myreur des Histors,' now lost, to the effect that there died in Liège, in 1372, a physician named Jean de Bourgogne, "dit à la barbe," who declared himself on his death-bed to be "Jean de Mandeville, chevalier, comte de Montfort en Angleterre," his real name having been concealed because of a crime committed in England. The veracity of D'Outremeuse is open to suspicion, but it has been thought that this Jean de Bourgogne may have been one John de Burgoyne, who was forced to leave England in 1322, and that he compiled the 'Travels,' borrowing the name of one John de Mandeville, who was concerned in the murder of Gaveston. At all events, Jean de Bourgogne was known in mediæval times as the author of a treatise on the plague, which is bound up in one instance with a version of the 'Travels.' It seems probable, then, that this man, whatever his past history may have been, was the real author of the latter work, and that he preferred to conceal his identity under the pseudonym of Mandeville.

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MANDINGOES, măn-dĕng'gōz, a linguistic group of West Africa, remarkable for their intelligence. The original country of this people was the north slope of the high table-land of Senegambia, between the head-waters of the Niger and Senegal. Their language is more widely diffused, and more employed by translators than that of any of the other languages of West Africa. They formed at one time a single large empire, but are now widely scattered. The hair is woolly but other facial negro characteristics are absent. From the Arabs they have derived a high degree of culture and are far removed from savagery. Their religion is Mohammedan. Consult Johnston, Sir H. H., 'Liberia' (2 vols., London 1906).

MANDIOCA, the staple food of Brazil. See CASSAVA.

MANDOLIN, a musical instrument, belonging to the lute species, played with a quill or plectrum as well as with the finger. It is of Italian origin, but latterly has become common in all civilized countries. In the usual form it has four pairs of metallic strings and a finger-board or neck with numerous frets across it. Operatic composers have occasionally employed the mandolin to obtain characteristic effects. The commonest form of this instrument is the Neapolitan with a range G — E^3. Other varieties are the Milanese with six strings, the Spanish with six double strings and the Turkish with seven double strings. There are four double strings in the Neapolitan.

MANDRAGORA. See MANDRAKE.

MANDRAKE, a genus of perennial herbs (*Mandragora*) of the order *Solanaceæ*. The species, of which only three are described, are almost stemless, thick-rooted and large-leaved, with rather large whitish or bluish bell-shaped flowers, followed by globular berries. The plant is chiefly interesting from the numerous allusions to it in old writings, the superstitions relating to it being mainly in connection with its fetid, reputedly poisonous root, which, from a fanciful resemblance of its roots to the human figure, was considered an aphrodisiac.

The May-apple (*Podophyllum peltatum*), of the order *Berberidaceæ*, is often called "mandrake" in the United States, where it is common east of the Mississippi River. It is a perennial herb which sends up umbrella-shaped leaves, usually two at the summit of a stem and bearing one or two creamy, fragrant flowers in the axil. A mawkish yellow fruit about the size of a large cherry develops during early summer. The fruits "are relished by pigs and boys." The creeping rootstocks have been used medicinally.

MANDRILL, the largest and one of the most repulsive and savage of the African baboons. (See BABOON). Consult DRILL.

MANED WOLF, a long-legged, slender-bodied, long-nosed, brightly reddish wolf (*Canis jubatus*) of eastern South America, which may be regarded as one of the "aguaras" or fox-dogs (q.v.). It is a denizen of forests, not being known south of the northern edge of the Argentine pampas; and goes about alone at night and secretly, seeking its food, which consists mainly of small rodents, frogs, insects and the like, and even some fruit. It will sometimes attack sheep, but is remarkably timid, and no one fears it.

MANES, mā'nēz, among the Romans, the souls of the dead. The good spirits were also called *lares,* and the evil *larvæ*. The manes were reckoned among the infernal gods; but a belief was prevalent that they sometimes appeared upon the earth in the form of ghosts, particularly on the 30th of August, 4th of October and 7th of November; whence the Romans considered these unlucky days.

MANES WORSHIP, from Roman *Manes* (q.v.), a term to denote the worship of the dead, whether of an ancestor of the particular worshiper or of some deified hero of his race. Herbert Spencer thinks it developed from the belief in an other self, which survived after death, and the manes worship was the outcome of a desire and endeavor to propitiate the ghost. Sir John Lubbock says of manes worship that it "is natural development of the dread of ghosts."

MANET, mą'nā', **Edouard,** French artist: b. Paris, 23 Jan. 1832; d. Paris, 30 April 1883. Originator of the Impressionist movement, which finds its greatest expression in Claude Monet, Manet worked in an original manner before Impressionism was thought of. He rendered great service to the movement, not solely by his works, but by taking upon himself the criticisms directed upon the whole Impressionist School. Dégas, Monet and Renoir, bold in art but timid of nature, resigned themselves to the misunderstanding and hostility of the public; but the more courageous Manet defended the movement with a strong controversial pen. He fought valiantly for himself and all the artists associated with his name.

Manet studied with Couture about 1850 and traveled throughout Europe, growing enthusiastic over Rembrandt, Tintoretto, Velasquez and Goya, painted some fine works such as the 'Buveur d'absinthe' and the 'Vieux musicien' and in 1861 exhibited at the Paris Salon portraits of his parents and the 'Guiterero.' His 'Déjeuner sur l'herbe' attracted much attention. 'Olympia' (in the Luxembourg) attracted more hostile criticism. It was a technical experiment significant for the period of its composition. 'Angels at the Tomb of Christ,' 'Lola de Valence,' 'Toréador tué,' 'Acteur tragique,' 'Jésus insulté,' the 'Gitanos,' 'Rouvière' and portrait of 'Eva Gonzalès' appeared before 1870. About this time Manet cast his lot with the Impressionists. The 'Fight of the *Kearsarge* and the *Alabama*' announced this transformation of his style and was followed by 'Musique aux Tuileries,' the 'Bal de l'Opéra,' the 'Bon Bock' and the 'Liseur.' 'Argentenil' (1875) shows his atmospheric researches. Next came a portrait of 'Desboutin' and the 'Linge' (1876), a portrait of 'Faure' as "Hamlet" (1877); 'La Serre,' a symphony in blue and white in which George Moore, the author, appears in boating costume (1878); the scene in the 'Père Lathuile Restaurant' (1880); 'Portrait of Rochefort' (1881); and the 'Bar des Folies Bergère' (1882).

"This work of Manet," writes a French critic, "so much discussed and produced under such tormenting conditions, owes its importance beyond all else to its power and frankness." Ten years of developing the first manner, tragically limited by the war of 1870; 13 years of developing the second evolution, parallel with the efforts of the Impressionists. The period from 1860 to 1870 is logically connected with Hals and Goya; from 1870 to 1883 (when he died) the artist's work is complicated by the study of light. He had all the pictorial gifts which make the glory of the masters — full, true, broad composition; coloring of great power; blacks and greys, which cannot be found often elsewhere than in Velasquez and Goya; and a profound knowledge of values. He tried his hand at everything: portraits, landscapes, seascapes, scenes of modern life, still life and under each in turn served his ardent creative brush. His pictures will always remain documents of the greatest importance on the society, the manners and customs of the Second Empire. A beautiful painter is what he was before everything else. It is almost inconceivable that the juries of the Salons failed to understand him. They waxed indignant over his subjects which offer only a restricted interest and they did not see the altogether classic quality of this technique without self-glorification, without tricks, without bitumen; of this vibrating color; of this rich paint; of this passionate design so suitable for expressing movement and gestures true to life; of this simple composition where the whole picture is based upon two or three values with the straightforwardness one admires in Rubens, Jordaens and Hals. Manet occupies an important place in the French School. He is its most original painter of the second half of the 19th century, the one who has really created a great movement. His work, the fecundity of which is astonishing, is unequalled.

MANETHO, or **MANETHO SEBENNYTA,** Egyptian historian: native of Sebennytus, in the Delta, and of the priestly order. He is believed to have lived in the reigns of Ptolemy I and II and to have written in the reign of Ptolemy I (323–285 B.C.), or of Ptolemy II (285–247 B.C.). According to some he was priest of Diospolis or Heliopolis; others contend that he was high-priest of Alexandria. His name has been interpreted variously as "Beloved of Thoth" or "Beloved of Neith." Scarcely anything is known of the history of Manetho himself, and he is renowned chiefly for his Egyptian annals. On the occasion of Ptolemy I dreaming of the god Serapis at Sinope, Manetho was consulted by the monarch, and in conjunction with Timotheus of Athens, interpreter of the Eleusinian mysteries, declared the statue of Serapis, brought by orders of the king from Sinope, to be that of the god Serapis or Pluto; whereupon the god had a temple and his worship inaugurated at Alexandria. The fame of Manetho was much increased by his writing in the Greek language, and so being enabled to communicate from Egyptian sources a more correct knowledge of the history of his native country than the Greek writers who had preceded him. Of this history, only extracts given by Josephus in his work against Apion, and an epitome by Eusebius and other ecclesiastical writers, remain. It appears to have been written in a compendious annalistic style of narrative, resembling the accounts given by Herodotus. The work of Manetho was in three books, the first began with the mythic reigns of gods and kings and ended with the 11th dynasty of mortals; the second continued the history from the 12th to the 19th dynasty; the third from the 20th to the 30th dynasty, when Egypt fell under the dominion of Alexander the Great. The reigns of the gods are given as amounting to 24,900 years, and the epoch of Menes, founder of the monarchy, commenced 3,555 years before Alexander (332 B.C.). The difficulties attending the

reconciliation of this chronology with the synchronestic history of the Hebrews, Greeks and other nations, have given rise to numerous speculations and chronological systems since the revival of learning. The accession of newer and better information from the original sources of Egyptian monuments, papyri and other documents has considerably enhanced the general value of the history of Manetho, which, prior to their discovery, had fallen into discredit. But the restoration of the history of Manetho, notwithstanding all these resources and the positive epoch of the monarchy, are still to be sought, though certain dynasties, in the second and third books of his works, can be reconciled with monumental evidence. Besides the true work of Manetho above cited, another work, 'Sothis,' or the 'Dogstar' (in allusion to the cycle of heliacal rising of that star of 1461 years) dedicated to Sebastos or Augustus, the title of the Roman emperors, has been handed down; but there is considerable support for the opinion that it is spurious, and was added by the epitomizers; and another work, called the 'Old Chronicle,' in which the history was arranged according to cycles, was compiled by them. Besides the history, Manetho wrote 'Tōn Physikōn Epitome,' treating on the origin of gods and the world and the laws of morality; and another work on the preparation of the sacred *kyphi*, a kind of frankincense. The astronomical work called 'Apotelesmata' is a spurious production of the 5th century after Christ. Consult Boekh, 'Manetho' (Berlin 1845); Bunsen, 'Egypt's Place in Universal History' (London 1848–67); Müller, C., 'Historici Græci Minores' (2 vols., Leipzig 1870–71).

MANEY, George, American soldier and diplomat: b. Franklin, Tenn., 24 Aug. 1826; d. Washington, D. C., 9 Feb. 1901. He was educated at the University of Nashville, fought in the Mexican War (1846–47), in 1849 was admitted to the bar and in 1849–61 practised law. On 1 May 1861 he became colonel of the First Tennessee Infantry, and at Shiloh (6–7 April 1862) he commanded first his regiment and later the 2d brigade of the 2d division. Promoted brigadier-general for his conduct at Shiloh, he commanded the 3d brigade of Cheatham's division in Bragg's army at Murfreesboro (31 Dec.–3 Jan. 1863) and Chickamauga (19–20 Sept. 1863), subsequently was appointed to the command of Cheatham's division and participated in the battle of Atlanta (22 July 1864). In 1876 he was nominated by the Republican party for the governorship of Tennessee, but before the election retired from the contest. He was Minister to Colombia in 1881–83, and to Paraguay and Uruguay in 1889–93. In 1884 and 1888 he was a delegate to the Republican National conventions of those years. In 1868–77 he was also president of the Tennessee and Pacific Railway.

MANFRED, king of Naples and Sicily, 1258–66: b. about 1231; d. 26 Feb. 1266. He was a natural son of the Emperor Frederick II, on whose death, in 1250, he became Prince of Tarentum, and acted as regent in Italy in the absence of Conrad IV, his half-brother. After the death of Conrad he was regent of the kingdom during the minority of his nephew Conradin. At the instigation of Pope Alexander IV a crusade was preached against him, and Manfred was temporarily driven from his kingdom, which, however, he soon recovered, and on the rumored death of Conradin had himself crowned king of Palermo, 10 Aug. 1258. The Pope at once excommunicated him and his followers, but Manfred marched into the papal territory and compelled acknowledgment as master of Tuscany. Through matrimonial alliances for himself and his daughter he sought to increase his power, and his administration of the government was efficient, benign and for a time prosperous. But the excommunication was renewed by Pope Urban IV, who also bestowed his kingdom on Charles I of Anjou, and a war ensued in which Manfred was finally defeated and killed at Benevento. After his death imprisonment and extreme cruelty were visited upon his widow and children.

MANFRED. Lord Byron's powerful and imaginative "witch-drama," 'Manfred' (1817), was composed under the spell of the awe-inspiring scenery of the Alps, which Byron had visited in 1816 on the tour through Germany and Switzerland recorded in the third canto of 'Childe Harold.' The hero is a sort of combination of Faust and of the Byronic type portrayed in the earlier verse tales, a lofty and defiant spirit, dwelling alone in a dark castle among the higher Alps, haunted by remorse for an act the nature of which we are left to guess. Seeking to interview the spirit of the dead Astarte, the victim of his crime, and to obtain her forgiveness, he calls up the spirits over whom he has control and at length resorts to the abode of the evil principle itself. The ghost is evoked, but returns an ambiguous answer to his question. On the morrow Manfred expires, after resisting a summons to repent from the old abbot of Saint Maurice and defying the demons who have come to possess his soul. Some biographers have seen in the poem a reflection of its author's relation with his half-sister, Aurora Leigh. In any case Byron has made his hero in his own image, infusing into him the characteristic Byronic spirit of proud rebellion and passionate despair. In style the poet aims at and partly succeeds in achieving an imaginative grandeur commensurate with his superhuman theme. 'Manfred' attracted the favorable notice of Goethe, to whose 'Faust,' translated in his presence by Monk Lewis in 1816, Byron is indebted for some of the essential elements in his drama. Consult 'The Works of Lord Byron' (edited by R. H. Prothero); and 'Cambridge History of English Literature' (Vol. XII).

JAMES H. HANFORD.

MANGABEY, măng'gą-bā, one of the odd West African monkeys of the genus *Cercocebus*, nearly related to the guenons and to the macaques. They are distinguished by the whiteness of the eyelids and the backward growth of the hair on the crown of the head. Some of the species are well known, especially the sooty mangabey (*C. fuliginosus*) which always carries its long tail turned over its back. There are three or four species and they make docile pets.

MANGALDAN, mān-gäl-dän', Philippines, a pueblo of the province of Pangasinán, Luzon, situated 12 miles northeast of Lingayén, the

provincial capital. It is on the coast road and is the meeting point of several roads extending to towns in the interior, and is on the route of the railroad from Dagupan to Manila. Pop. 15,800.

MANGALORE, măng-gą-lōr', India, a seaport town, on the Malabar coast, capital of the district of South Kanara, Madras presidency. It is clean and well built, surrounded by groves of coconut palms and stands on the edge of a fine salt-water lake or back-water formed at the mouths of two rivers. The port will not admit of vessels drawing more than 10 feet of water, except in spring tides; but there is good anchorage off the mouth of the river, in five to seven fathoms. Tile-making is an important industry. The exports are principally coffee, rice, sandal-wood, cassia and turmeric; the imports sugar, salt and piece-goods. There is a Roman Catholic college, and the Basel Lutheran mission in India has its headquarters here. The Roman Catholics have a bishop and several churches, a considerable number of the natives belonging to this faith. It was captured by the Portuguese in 1596 A.D., and by the English in 1668, finally falling into British possession in 1799. Pop. about 48,412.

MANGANESE, măn-gą-nēs', a metallic element which is widely distributed in nature, though it never occurs except in combination with other elements. The dioxide was believed to be a compound of iron until 1774, when Scheele proved it to be a compound of a previously unknown metal; and in the same year Gahn prepared the element in its metallic form. It was first called "magnesium," from the fact that it was prepared from a compound then called "magnesia nigra" (and now known as manganese peroxide or dioxide); but in 1808 the name was arbitrarily changed to "manganese," by Buttmann.

Manganese may be prepared in the metallic form by reducing any of its oxides with carbon at a white heat, and this is the method followed commercially. For experimental purposes, however, it is easier to obtain it by reducing the chloride with metallic sodium or magnesium. The physical properties of manganese vary somewhat according to the precise way in which the metal is obtained. Its melting-point may be taken as 3500° F., its specific gravity as 7.4 and its specific heat is 0.122. It is a gray, hard, brittle, lustrous metal, susceptible of taking a high polish, and resembling iron in most respects, both physically and chemically. It is not magnetic, however. The pure metal does not appear to be affected by dry air, but moist air oxidizes it, at least superficially. Some authorities describe it as oxidizing readily in common air, and as decomposing water with almost as great a facility as potassium; but it appears probable that the specimens from which these results were obtained contained impurities of some sort. Metallic manganese is not used in the arts, but some of its alloys with iron, aluminum and copper are valuable. It is particularly valuable in steel, its presence in small amount increasing the hardness, tenacity and elasticity of the metal. It is added to the molten steel, in the process of manufaoture, in the form of an iron-manganese alloy containing from 10 to 80 per cent of the latter metal, and known in the arts as "spiegeleisen" or "ferromanganese." The "manganese" of commerce is usually not the metal itself, but a mixture of its oxides. Manganese is used in the steel industry almost entirely in the form of two alloys, ferromanganese and spiegeleisen. These are both alloys of iron, manganese and carbon. Ferromanganese may contain as much as 80 per cent of manganese, but averages in this country about 70 per cent. In spiegeleisen the percentage of manganese is much lower; the standard figure upon which the price is based is 20 per cent. The average manganese content is about 18 per cent. Both alloys are high in combined carbon, the amount of which runs up to 7 per cent. The manganese alloys are added to molten steel from the converter, or open hearth furnace, for the purpose of introducing both manganese and carbon. The manganese cleanses the steel by combining with the contained oxygen and, to some extent, with the sulphur, and then carries these impurities into the slag. The carbon is for the purpose of giving the steel the required hardness and strength. By adding larger amounts of the alloys, manganese steel is produced, which is noted for its hardness, tenacity and durability. It is much used in the wearing parts of heavy machinery. In recent years the tendency has been to use more ferromanganese and less spiegeleisen, on account of the much smaller amount of ferromanganese that it is necessary to add to the steel. Spiegeleisen usually has to be melted in a cupola furnace before using, but ferromanganese can be added direct. The latter also introduces less carbon, which sometimes is an advantage. Ferromanganese and spiegeleisen are produced by smelting a mixture of manganese ore and iron ore in an ordinary blast furnace. A high temperature is required and the amount of fuel used is much greater than in iron smelting. A considerable amount of the manganese goes into the slag. The slag from a ferromanganese furnace may contain as much as 10 per cent of manganese. A considerable tonnage of the iron manganese alloys is now produced in the electric furnace.

Chemically, manganese is a dyad. It has the symbol Mn, and an atomic weight of 55 if O=16, or 54.6 if H=1. It forms numerous oxides, the best known of which are (1) the monoxide, MnO, from which the manganous salts may be prepared, and which is itself obtained by heating manganese carbonate out of contact with the air; (2) the sesquioxide, Mn_2O_3, which exists in nature as the mineral braunite, and which is also formed when the monoxide is heated in air to a red heat; (3) the red or mangano-manganic oxide, Mn_3O_4, which corresponds to the magnetic oxide of iron, does not form salts, and exists in nature as the mineral hausmannite; (4) the black oxide, or dioxide, MnO_2, which occurs in nature as pyrolusite and varvacite, and which is largely used in the arts in the preparation of oxygen and chlorine; (5) the trioxide, MnO_3, which is difficult of preparation and very unstable; and (6) the heptoxide, Mn_2O_7, a heavy, dark green liquid, prepared by treating potassium permanganate with cold concentrated sulphuric acid. Several of these oxides also occur in a hydrated form, as minerals. Of the soluble manganous salts, the chief representatives are the sulphate and the chloride. Manganous sulphate, $MnSO_4$, is prepared by treating the dioxide with sulphuric

acid, oxygen being liberated at the same time in accordance with the equation $MnO_2+H_2SO_4=MnSO_4+O+H_2O$. It crystallizes with five molecules of water, as a pink-colored salt, and is used in dyeing and in medicine. The chloride, $MnCl_2$, crystallizes with four molecules of water, and is obtained as a by-product in the manufacture of chlorine by the action of hydrochloric acid upon manganese dioxide. It is used in calico printing. Of the insoluble manganese salts we may specially note the sulphide and the carbonate. The sulphide, MnS, is thrown down as a flesh-colored precipitate, when a soluble manganous salt is precipitated by an alkaline sulphide. The carbonate, $MnCO_3$, occurs native as the mineral rhodochrosite, and it may also be obtained as a white precipitate by adding an alkaline carbonate to a solution of manganeous sulphate or chloride.

Two other important classes of manganese compounds are known, in which the manganese does not act as a base, but as an acid-forming element. These are the manganates and permanganates, which may be regarded as the salts or "manganic acid," H_2MnO_4, and "permanganic acid," $HMnO_4$, respectively. The potassium salts of these acids are by far the most important ones. Potassium manganate, K_2MnO_4, may be prepared by melting manganese dioxide with caustic potash and a little potassium chlorate, dissolving the bright green mass so obtained in a small quantity of water, and crystallizing by evaporation in a vacuum. Potassium manganate is used in laboratory operations, but it is very unstable, taking up oxygen with great readiness, and depositing hydrated dioxide of manganese. If the green solution containing potassium manganate be allowed to stand in the air, it absorbs oxygen, changes in color to a bright purple and deposits hydrated manganese dioxide. The purple color is due to the presence of potassium permanganate, $KMnO_4$, which may be obtained, by crystallization, in the form of purple prismatic crystals. Potassium permanganate is a powerful oxidizing agent, and is extensively used in chemistry, in the arts and in medicine, on account of the facility with which it parts with oxygen, especially in the presence of organic matter. It forms the basis of "Condy's fluid," which is largely used as a disinfectant.

The chief ores of manganese are the black oxide pyrolusite (MnO_2, 63.2 % Mn); psilomelane ($MnO_2.H_2O$, 45–60 % Mn); braunite (3 Mn_2O_3. $MnSiO_3$, 69.7 % Mn); wad which is an earthy oxide (Mn 15–40 %); manganite ($Mn_2O_3.H_2O$, 62.4 % Mn); rhodochrosite ($MnCO_3$, 61.7 % MnO), and franklinite [$(Fe3nMn)O(FeMn)_2O_3$]. The ores are often associated with other metals, particularly with iron oxides, and with silver ores. Like residual limonite (see IRON ORES) manganese ore is usually secondary, resulting from the removal of more soluble substances during the weathering of slightly manganiferous rocks. For many years prior to 1914 Russia was by far the greatest producer of high grade manganese ores. Most of this output came from one locality near Chiatouri, south of the Caucasus Mountains. Some engineers have estimated the total reserves of high grade manganese ore in this one district to be upward of 100,000,000 tons, although this has been disputed. For some time before the war Russia's production averaged more than half a million tons yearly. Next in importance to Russia as sources of manganese are Brazil and India. In Brazil there has been a very rapid development of the industry and the production of manganese ore in 1917 is estimated to have been about 500,000 tons. As the war has practically stopped the exportation of manganese from Russia and India, the deposits in Brazil have assumed very great importance. The United States has never been a large producer of manganese ore. A writer in the *Mineral Industry* some years ago stated that the manganese output of the country was "insignificant because of the trifling character of the deposits." In 1914 the total production in the United States of ore containing 40 per cent or more of manganese was only 2,635 long tons. In the production of ferromanganese and spiegeleisen and in the other arts using manganese compounds it is desirable to have an ore containing at least 40 per cent of the metal. Before the late war it was almost impossible to find a steel maker willing to buy a lower grade. During the war some steel makers bought ore containing only 28 per cent manganese and were glad to get it. Most of the manganese bearing ores mined in the United States are classified as manganiferous iron ores, which may or may not contain silver and lead. In these ores the manganese is mainly valuable as a flux in smelting operations, although it can sometimes be used for making spiegeleisen. The recent high prices have resulted in a material increase in the domestic production of high grade ore and the output for 1917 is estimated at about 120,000 tons. This amount is still much below the requirements. The United States Geological Survey has recognized the importance of the manganese situation and has recently issued a bulletin giving a list of all the shippers, prospective shippers and purchasers of manganese ores in the United States, completed up to 1 Oct. 1917. This list was reprinted in the *Engineering and Mining Journal* for 26 Jan. 1918. It included the names of 171 individuals and companies producing or about to produce manganese ores, and 117 companies that are listed as purchasers. The shippers are located in 21 different States, of which the most important are Arizona, Arkansas, California, Colorado, Georgia, Minnesota, Montana, Tennessee, Utah and Virginia. In 1910 the United States Geological Survey issued a very excellent monograph, Bulletin No. 427, entitled 'Manganese Deposits of the United States,' by Edmund Cecil Harden, giving very complete data in regard to ores, alloys, production and uses. The same author contributed a paper entitled 'Manganese Ores of Russia, India, Brazil, and Chile,' to the 'Transactions of the American Institute of Mining Engineers' (Vol. LVI, p. 31). In the same volume there is an article by Joseph T. Singewald, Jr., and Benjamin Leroy Miller on 'The Manganese Ores of the Lafayette District, Minas Geraes, Brazil.' In the *Engineering and Mining Journal* (issue of 9 Feb. 1918) is a popular article by Henry V. Maxwell entitled 'Prospecting for Manganese.' See MINERAL PRODUCTION OF THE UNITED STATES.

MANGANESE BRONZE, a metallic element in which the copper forming the base of the alloy is mixed with a certain proportion of ferro-manganese, and which has exceptional

qualities in the way of strength and hardness. Various qualities are manufactured, each suited for certain special purposes. One quality, in which the zinc alloyed with the treated copper is considerably in excess of the tin, is made into rods and plates, and when simply cast is said to have a tensile strength of about 24 tons per square inch. Another quality has all the characteristics of forged steel without any of its defects. Another quality is in extensive use for toothed wheels, gearing, brackets and all kinds of machinery supports. From its non-liability to corrosion it is largely employed in the manufacture of propellers.

MANGANITE, native hydrated oxide of manganese, MnO (OH), or $Mn_2O_3.H_2O$. It crystallizes in the orthorhombic system, but also occurs in columnar and stalactitic forms. It is brittle, and has a hardness of 4 and a specific gravity of about 4.3. It is steel gray to iron black in color, and opaque with a submetallic lustre. It occurs in the Harz region, in Norway and Sweden and in the British Isles. In the United States it is found in the Lake Superior mining district, and in Douglas County, Colo. It also occurs in Nova Scotia and New Brunswick. Manganite is used as a source of manganese for the preparation of spiegeleisen and other alloys, and also in the manufacture of pigments and dyes.

MANGASARIAN, Mangasar Mugurditch, American author and lecturer: b. Mashgerd, Armenia, 29 Dec. 1859. He was educated at Robert College, Constantinople, 1872–76 and at Princeton Theological Seminary. He entered the Presbyterian ministry in 1882 and held a pastorate in Philadelphia 1882–85, when he resigned to become an independent preacher and lecturer. In 1900 he organized the Independent Religious Society, Rationalist, at Chicago, and has been its lecturer since that time. He is the author of 'A New Catechism' (1902); 'The Truth about Jesus' (1909); 'How the Bible was Invented' (1910), and numerous other works.

MANGATAREN, măn-gă-tä'rĕn, Philippines, a pueblo of the province of Pangasinán, Luzon, 18 miles south of Lingayén; it is on the Agno River road. Pop. 10,150.

MANGE, a cutaneous disease to which dogs, horses, cattle, etc., are liable. It resembles in some measure the itch in the human subject, ordinary mange being due to the presence of a burrowing parasite. Both local application and internal remedies are used in its cure. Frequent washing of the skin is essential. See ITCH.

MANGEL-WURZEL. See BEET.

MANGIN, Joseph, French general: b. 1865. Descended from a distinguished Lorraine family, he served from his 24th year in Tonkin and in every part of Northern Africa, and accompanied Marchand on his historic journey from the Congo to the Nile in 1898. He first came under public notice in 1911, when, as military instructor to the Moroccan forces of Sultan Mulai Hafid, he defended Fez against the rebellious Berber tribes. In August 1912 he led a flying column of 4,000 men from Fez to Marakesh, effecting a dramatic rescue of nine French prisoners held by the pretender El Hiba. He received the congratulations of his government and was made a commander of the Legion of Honor. At the outbreak of the European War he was given a brigade command in the 5th Army, which took the shock of the first German onset at Charleroi. At the Marne he led a division and was heavily engaged at the battle of the Aisne. After participating in various other battles he arrived at Verdun with his division in March 1916. Here he led his men to the recapture of La Caillette Wood and (22 May) to the brilliant but shortlived reconquest of Douaumont. He was placed in command of the new 3d Colonial Corps in June and given charge of the crucial sector on the right bank of the Meuse. In October his command recaptured Douaumont and also Fort Vaux, with nearly 5,000 prisoners. He deprived the Germans of a wide sweep of territory around Verdun in December, and in the spring, conducted a big offensive between Soissons and Rheims, which was suddenly stopped. Mangin was relieved of his command and relegated to an obscure post through a cabinet crisis. With the accession of Clemenceau, Mangin was sent back to the field. In the summer of 1918 he commanded the French-American forces operating between the Aisne and the Marne, delivering smashing blows against the German lines which contributed enormously to ultimate victory.

MANGLE, a machine for smoothing linen and cotton goods. See LAUNDRY MACHINERY.

MANGO, măn'gō, a genus of trees (*Mangifera*) of the family *Anacardiaceæ*. The 30 species are natives of southeastern Asia, where some of them have been distributed by man throughout the tropics of both hemispheres. The wood of various species is used for boat and canoe making, for house building and for boxes. It is gray, rather soft and easily worked. The trees are valued also for shade, being of large size and attractive form, and very leafy, the leaves large, leathery and evergreen. It is for their fruits, however, that they are most esteemed. These are widely used for human food, especially in the East, either ripe, in which condition they are eaten raw, with or without wine, sugar and spices, or unripe as preserves, jellies or pickles. They are also used for making wine and glucose. The finer varieties are considered equal to the choicest pineapples and even to the mangosteen.

The most commonly planted and most widely distributed species is the common mango (*M. indica*), a native of India. It often exceeds 40 feet in height, bears terminal panicles of rather small pinkish or yellow flowers, followed by smooth kidney-shaped yellow or reddish fruits which often weigh more than half a pound. Each fruit contains one large flattened seed, almost as long and often nearly as wide as the fruit, but flattened like the seed of a melon. The kernel is often roasted and eaten like chestnuts. The pulp of the fruit is soft, luscious in the finer varieties but very fibrous in the inferior sorts. These have a more or less pronounced flavor, suggestive of turpentine, which is characteristic of all parts of the tree. Since 1782, when the mango was introduced into Jamaica with a lot of other plants taken from a French vessel captured on its way to Haiti, the fruit has spread throughout the West Indies and southern Florida. In Florida, however, the

freeze of 1886 destroyed all trees except those in the extreme southern part, where the mango is now confined. The market, which seems to be growing but is somewhat limited because of the prevailing ignorance regarding the fruit, is supplied mainly from the West Indies. California supplies little more than its home markets. The trees do best upon well-drained sandy land, and should be well supplied with potassic manures. They quickly fail to bear upon wet soils. They may be propagated by grafting, but since a large proportion of the varieties reproduce practically without change by seed this method is widely employed.

Several other species of mangoes are cultivated. For instance, the horse mango (*M. fœtida*), a native of Malacca, is cultivated in India, and *M. sylvatica*, whose fruits are dried and used like prunes.

MANGO-BIRD. Several birds are called mango-birds in various parts of the world because they frequent mango-trees. The East Indian one is an oriole (*Oriolus kundoo*); the West Indian one, so called in Jamaica, is a humming-bird (*Lampornis violacauda*), which may occasionally visit Florida.

MANGO-FISH, one of the threadfins a small perch-like sea-fish (*Polynemus plebijus*) which is numerous along Oriental coasts, and approaches the shore and is caught at the time when mangoes ripen. The same name is sometimes given to a relative in the West Indies (*Polydactylus virginicus*), called barbudo in the Cuban markets.

MANGOSTEEN, a tree (*Garcinia mangostana*) of the family *Guttiferæ*, native of the East Indies, sometimes cultivated in tropical America. It is one of the best-known fruits of the East Indies, and by many people is considered the finest fruit known. The fruits are about the size of a mandarin orange and of similar shape, with a thick, red-purple rind; the flesh is snow-white or cream-colored, so delicate that it melts in the mouth, and of delicious flavor. So far, attempts to grow the tree in Florida have been unsuccessful, and as the fruit does not bear shipping well it is little known outside the regions where it is grown.

MANGROVE, măn'grōv, a genus of trees and shrubs (*Rhizophora*) of the family *Rhizophoraceæ*. The species, of which there are less than half a dozen, are all natives of the tropics, where they inhabit tidal marshes and the mouths of streams. They are remarkable for their aerial roots, which extend from the branches to the mud and then become trunks for the extension of the trees, which gradually advance even to low tidal mark; and also for their peculiar method of seed germination, the seeds sprouting while still attached to the twigs. The wood, which in some species is close-grained and durable, is used for fuel and to a small extent for other purposes; the bark, which is rich in tannic acid, is employed in tanning; the fruit of some species is edible and is used for wine making. The trees are important soil builders, their numerous roots serving to catch débris and by checking the current enhance the settling of mud from the water. Hundreds of acres of arable land have thus been formed in Florida. The best-known species is *R. mangle*.

MANGROVE HEN, a West Indian clapper-rail (*Rallus longirostris*), which seeks its food in the mangrove swamps.

MANGROVE SNAPPER, the gray snapper, an excellent food-fish, which abounds among the mangroves along the coasts of Florida and the Bahamas, and thence to Brazil. See SNAPPER.

MANGUANGAS, măn-gwăn'gās, a collective name for a number of heathen tribes living in the forests of the island of Mindanao, Philippines. They are of the Malay race. See PHILIPPINE ISLANDS.

MANGUIANES, măn-gē-ānz', the natives of the interior of Mindoro, Romblon and Tablas (qq.v.), Philippines; they are divided into four branches, one of which is of Negrito blood, another is Mongoloid and the other two are of the Malayan race. There are several tribes, including the Bangot, the Buquil, etc. The term is also used in the island of Palawan to designate all wild natives of unknown origin. See PHILIPPINE ISLANDS.

MANGUM, măng'gŭm, **Willie Person,** American legislator: b. Orange County, N. C., 1792; d. Red Mountain, N. C., 14 Sept. 1861. He was graduated from the University of North Carolina in 1815, was admitted to the bar in 1817, in 1818 was a member from Orange County of the lower house of the State legislature and in 1819 became a judge of the Superior Court. From 1 Dec. 1823 to 18 March 1826 he was a Whig representative in the 18th and 19th Congresses; but this post he resigned, and again he was elected a judge of the Superior Court. He retired from the court in 1826, but filled the office a third time in 1828–30. He was a United States senator from 5 Dec. 1831 to 1836, when he resigned, and from 9 Dec. 1840 to 3 March 1853; and in 1842–45 was president pro tempore of the Senate. Throughout nearly his entire term of service in Congress he was a leader of the Whigs; and in 1837 he received the 11 electoral votes from South Carolina for the Presidency of the United States.

MANGUM, Okla., village and county-seat of Greer County, on a fork of the Red River, about 150 miles southwest of Oklahoma city at a junction of the Chicago, Rock Island and Pacific, and the Wichita Falls and Northwestern railroads. It is situated in a rich agricultural district, and has cotton gins, grain elevators and flour and lumber mills. Pop. about 3,667.

MANHATTAN, one of the boroughs comprising the city of New York. See NEW YORK CITY.

MANHATTAN, Kan., city, county-seat of Riley County, on the Kansas River at the junction of the Big Blue, and on the Chicago, Rock Island and Pacific and the Union Pacific railroads, about 50 miles west of Topeka. The surrounding region is mainly agricultural; limestone quarries are in the vicinity. The chief industrial establishments are a foundry, machine shops, flour mills, lumber and brick yards. Manhattan is the trade centre for a large section, and ships livestock, grain and limestone. The city is operated by the commission form of government, and owns and operates the waterworks. Pop. about 5,722.

MANHATTAN COLLEGE, an institution in Manhattan borough of New York City directed by the Christian Brothers. It was opened originally (1849) as an academy for young men, under the name of the Academy of the Holy Name, but the constant increase of the student body and the consequent demand for higher branches of study forced the academy to adopt the college courses, which was done in 1853, the academy being then incorporated under the name of Manhattan College. The courses lead to the degrees of B.A., M.A., B.S. and C.E. The resources of the college are derived from tuition only, there being no endowment. The institution reported at the end of 1917: professors and instructors, 26; students, 350; volumes in library, 14,000; value of ground and buildings, $625,000; income, $49,000; number of graduates, about 1,000.

MANHATTAN ISLAND. See NEW YORK CITY.

MANI, mä'nē, the founder of the sect of Manichæans. See MANICHÆANS.

MANI', mä-nē', the indigenous peanut of Cuba, Peru and Chile. In Mexico and Central America it is called *cacahuate* (q.v.).

MANIA. See INSANITY.

MANICALAND, mä-nē'ka-länd, South Africa, a former territory of southern Rhodesia, situated on the border of Portuguese East Africa, east of Mashonaland, between the parallels of 18° and 21° S., and the meridians of 30° 30′ and 33° E. It is now divided between Portuguese East Africa and Rhodesia. Manica is now a small district of the Portuguese territory. See RHODESIA.

MANICHÆANS, măn-ĭ-kē'ąnz, the followers of Manes, Mani or Manichæus, as he is variously styled, a Gnostic teacher, whose opinions prevailed in western Asia and eastern Europe during the 4th and 5th centuries of our era. Manichæism is generally considered to be the Persian type of gnosis, as it is distinguished by Zoroastrian dualism, and other features of that system. Hebrew elements of religion and Buddhistic doctrines were also found in Manichæism, which appears to have been an electic jumble of wild fancies, among which the soberest and strongest dogmas of the Christian creed were sometimes seen to be embedded. The Dualism of Manes was conceived of by him as manifested in two contiguous realms of light and darkness, good and evil. The kingdom of light included a heaven and an earth, the latter guarded by æons, or good spirits, and presided over by a spirit of goodness. From the kingdom of darkness sprang Satan and his evil angels. This confusion and mixture, in the universe, of light and darkness, originated before the creation of man, a creature of light and darkness combined in proportions varying in each individual. The human race is finally to be purged of darkness and sin. Jesus Christ was looked upon as dual in nature; there was Jesus who did not and could not suffer, *Jesus impatibilis,* a sort of phantom or immaterial personage, and *Jesus patibilis,* who suffered death upon the cross.

The practical side of Manichæism appears in the condemnation of marriage, or sexual indulgence of any sort, and the ascetic purification of hands, mouth or bosom, which kept the initiated from eating animal food, contracting ceremonial defilement through the touch and indulging the flame of human passion in the heart. There were two classes of disciples, the initiated, or *perfecti,* and the *auditores,* hearers, or novices. Saint Augustine of Hippo was, for nine years before his conversion to Christianity, a Manichæan hearer. These hearers lived a much less strict life than the perfecti, and consituted by far the majority of the Manichæan sect. The clergy of this sect were organized after the model of the Christian ministry; their rite of baptism was performed with oil instead of water; they had also a eucharistic meal among their public ceremonies. The system spread rapidly through the Roman Empire and competed with Neo-Platonism in hostility to the Church. Diocletian persecuted the Manichæans, and under Justinian the profession of Manichæism was a capital crime. The system, however, flourished in Asia beyond the 10th century and has reappeared in some shape or other, and under different names at different times in subsequent periods of European history. Consult Routh, 'Acta Disputationis Archelai' (1848); Eusebius, 'Ecclesiastical History'; De Beausobre, 'Histoire critique du Manichéisme' (1734), and Harnack, 'History of Dogma' (1897).

MANIFEST, *in law,* a written instrument delivered by the captain of a ship to the customs officials setting forth in detail the goods shipped, the consignors, etc. If there are passengers on board, this must be stated, and if the ship is about to proceed to a foreign port, the coal or other fuel on board must be set forth.

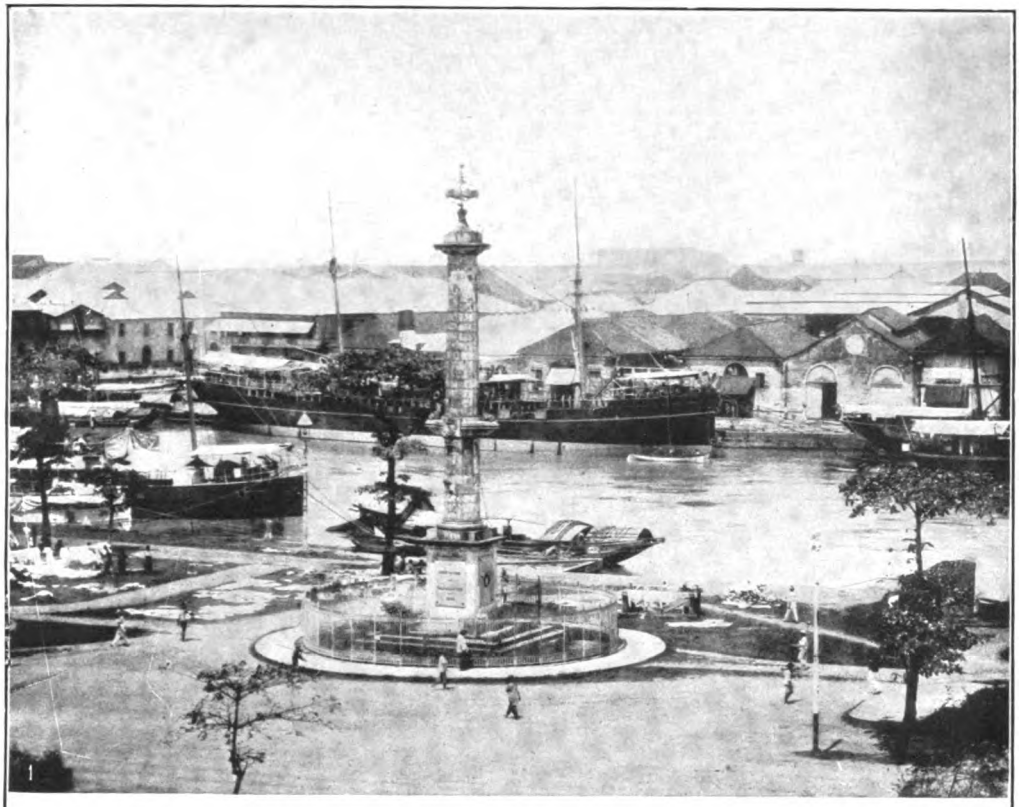
MANIFESTO, *in international law,* a declaration publicly issued at the commencement of a war by a contending power to show the cause which justify such a measure. Manifestoes are in the form of public letters; they commence with a short address to the public in general, and are signed with the name of the person who issues them. See LAW, INTERNATIONAL.

MANIFOLDS, Theory of. See ASSEMBLAGES, GENERAL THEORY OF.

MANIGAULT, Arthur Middleton, American soldier: b. Charleston, S. C., October 1824; d. 16 Aug. 1886. In 1846 he was elected first lieutenant of the Charleston company in the «Palmetto» regiment for the Mexican War, throughout which he served. In June 1861 he was elected colonel of the 10th regiment, South Carolina infantry, and in 1861-62 was in command of the 1st South Carolina military district. From the early part of 1862 he served in the army of the West successively under Bragg, Johnston and Hood, in 1862 was placed in command of a brigade, and in 1863 made brigadier-general. At Chickamauga he distinguished himself by his repeated assaults, and in the retreat before Sherman's invasion he did some vigorous fighting. His death was hastened by a wound received in the battle of Franklin, Tenn. (30 Nov. 1864). Subsequent to the war he was elected by the Democrats adjutant-general of South Carolina, serving until his death.

MANIHOT. See CASSAVA.

MANILA, mą-nĭl'ą or mä-nē'lä, the capital of the Philippine Islands, the principal city of Luzon as well as of the archipelago, situated in lat. 14° 35′ 31″ N. by long. 120° 58′ 8″ E., lies



1 Magellan Monument by the Pasag River, Manila

2 A Street of Nipa Huts in Manila

on both sides of the Pasig River, and has a frontage of four miles on the bay of Manila. The corporate jurisdiction for police purposes extends three miles from the shore over Manila Bay, making the total area under the police jurisdiction of the city 32 square miles or 20 square miles on land, and 12 on the bay. The name of the city is a corrupt form of a Tagalog word, originally written "Maynila," and means a species of shrub or brush which formerly grew on the site of the city. It is now applied not merely to the town within the walls, but to the whole region and the inhabitants included within the corporate limits. The most important divisions of the city are the walled town, particularly known as Manila, on the left bank of the river and Binondo on the right bank. Other districts, formerly more independent than at present, have retained their names and some degree of individuality. Immediately south of the walled town lies Ermita; farther on along the shore is Malate; and inland directly east of these lie Paco, Pandacan and Santa Ana. The most northern district on the shore of the bay is Tondo, and between this district and the lower part and mouth of the river lies San Nicolas. The other districts north of the Pasig are Quiapo, San Miguel, Sampaloc, Santa Cruz and Trozo.

The walled town was occupied chiefly by the members of the Spanish colony. Its streets are straight and run at right angles with one another, dividing the area within the wall into 54 blocks. The buildings have usually two stories, and are built like the houses of Spanish cities. It contains the cathedral, the principal religious houses and churches of the ecclesiastical orders, various schools, the University of Saint Thomas, the hospital of San Juan de Dios, the mint and the new city hall. This building was started by the Cosmopolitan Hospital Association in 1901 but owing to lack of funds remained uncompleted and was purchased and completed by the city authorities. The cathedral is an imposing building.

The north wall of the town extends along the bank of the Pasig. Around the outside of the rest of the wall runs a moat receiving water from the river just east of the town and emptying into the river just west of it. Until 1852 the drawbridges across the moat at the several gates were raised every evening at 11 o'clock, and lowered in the morning at 4. Since then it has not been customary to close the gates.

Only a few of the streets of Manila, of which there are about 80 miles, are paved. The rest are macadamized. European and American retail shops occupy the Escolta, in Binondo. The street called Rosario is almost entirely given up to Chinese shops. The wholesale houses and the banks occupy the district north of the Pasig and west of the Bridge of Spain.

Miguel Lopez de Legaspi established Spanish authority at Manila in 1571, by a treaty with Lacandola, Rajah of Mavnila, which was confirmed by the compact of blood made between the contracting parties. On 3 June 1571, he conferred upon Manila the title of "distinguished and ever loyal city." This title was subsequently confirmed by royal decree. He also gave the city a municipal organization, by appointing two *alcaldes*, one *aguacil mayor* and 12 *regidores*. He also appointed one notary for the *cabildo*, or corporation, and two notaries public for the court of the alcaldes. Later there were only eight regidores, but in addition a registrar and a constable. The alcaldes were justices, and were elected annually from the householders by the corporation. The regidores were aldermen and with the registrar and constable held office permanently as a proprietary right. The permanent positions in the cabildo could be bought and sold or inherited. This form of organization was maintained throughout the Spanish period.

In 1578 the church and all the inhabitants of Manila were separated from the jurisdiction of the archbishop of Mexico, and the church was erected into a cathedral, but the new bishop was subject to the archbishop of Mexico. On account of the long time needed to communicate between Spain and the Philippines the king ordered the governor of the islands to fill vacancies in the cathedral whenever they might occur.

As early as the beginning of the 17th century the city of Manila was surrounded by a wall of hewn stone about three miles in circuit. It contained a college conducted by the Jesuits, a school for girls called the Santa Potenciana, two hospitals, one for Spaniards and one for Filipinos, a house of mercy for receiving sick slaves and furnishing lodgings to poor women and a hospital for Chinese. At this time there were within the walls about 600 houses built of stone and mostly occupied by Spaniards. There were also about 2,000 Chinese, with 200 shops, and a garrison of 200 soldiers.

In the war between England and Spain, in 1762, Vice-Admiral Samuel Cornish was ordered to proceed against Manila. He carried British and Sepoy forces under Sir William Draper. On 6 Oct. 1762 Archbishop Rajo, as acting governor, surrendered the city, agreeing to pay the British an indemnity of $4,000,000. Only a part of this was paid. The affairs of Manila were administered by the British military authorities until 10 Feb. 1763. After this Manila remained uninterruptedly under the control of the Spanish until 13 Aug. 1898, when it was surrendered to the authorities of the United States. On 20 August the military government opened the custom-house for business, continuing in force the Spanish tariff and customs regulations. In 1899 the Filipinos in insurrection made several attempts to destroy the city. The attempts on 4 and 22 February resulted disastrously to the insurrectos. A similar undertaking was planned for the occasion of General Lawton's funeral.

The political relation of Manila to the central government of the islands is not greatly unlike that which Washington holds to the Federal government of the United States. The city was incorporated by an act passed by the United States Philippine Commission on 31 July 1901. The government is vested in a municipal board of five members appointed by the civil government, with the advice and consent of the Commission. The municipal board has certain legislative and executive authority. The organic act provides also for a secretary and other officers, and prescribes their powers and duties. The insular government contributed to the municipality 30 per cent of the city's net expenditure, and the balance is met by funds derived from city taxes. To illustrate: the expenses for the fiscal year 1907 were

$3,871,964.92. Of this sum the insular government contributed 30 per cent, or $1,161,589.48. The total receipts, including this contribution, were $4,103,220.80 leaving $231,255.88 as excess of receipts over expenditures. The population of Manila, reported by the census published in 1905, was 219,928.

During recent years the city has been in a large measure transformed. An elaborate system of electric street railways has been constructed, and has been in operation for a number of years. The waterworks provided by the foundation made by Carriedo had been made inadequate by the growth of the city, and a new system has been constructed. The old sewers, or such as existed, discharged into the moat about the wall or into open estuaries. They furnished a very imperfect means for disposing of the sewage of the city, and have been superseded by a new and elaborate system. The harbor which afforded vessels little or no protection from typhoons has been made safe and convenient. Large ships were obliged to lie in the bay two or three miles from shore, and to transfer passengers and freight to land in lighters. An enclosed harbor has been constructed by building a long breakwater southward from the mouth of the Pasig River, and by dredging the bottom of the sea in front of it. The material thrown out has been deposited behind a bulkhead, making 200 acres of new land. The largest ships can now dock at piers constructed within this secure harbor. The construction of this harbor has cost somewhat more than $4,000,000, and the work was practically finished in 1908. A general plan for the development and improvement of the city was formed by Mr. D. H. Burnham, who was engaged by the Commission to visit Manila for this purpose.

The Luneta is an elliptical drive and promenade on the shore of the bay between the city wall and the houses of Ermita. It has been greatly enlarged by the American government, and it has ceased to be a place for public executions. A military band gives a concert here nearly every evening.

Among the statues adorning public places the most noteworthy are that of Charles IV in the square in front of the «Palace» or Ayuntamiento building, that of Isabella II in the plaza of Malate and that of Legaspi and Urdaneta near the Luneta. Other monuments are the Magellan column standing on the south bank of the river just below the Bridge of Spain, and the Anda monument on the same bank nearer the mouth of the river. The division of the city into two parts by the Pasig and the presence of numerous estuaries has necessitated the building of a large number of bridges. The most noteworthy of these are the Bridge of Spain and the Ayala Bridge. Among the noteworthy establishments or institutions in the city are the Philippine General Hospital, the university and the special schools, the public library, the government laboratories, the government printing office and the government cold storage and ice plant.

Vessels approaching Manila by sea from the northwest first sight the Capones Grande light off the southwest coast of Zambales. Vessels from the ports of Indo-China first sight the Corregidor light. Vessels from Singapore, Java, India, Borneo, and all the southern ports of the Philippine Islands sight the Cabra Island light. All converge on the Corregidor light at the entrance of the bay.

BERNARD MOSES,
University of California.

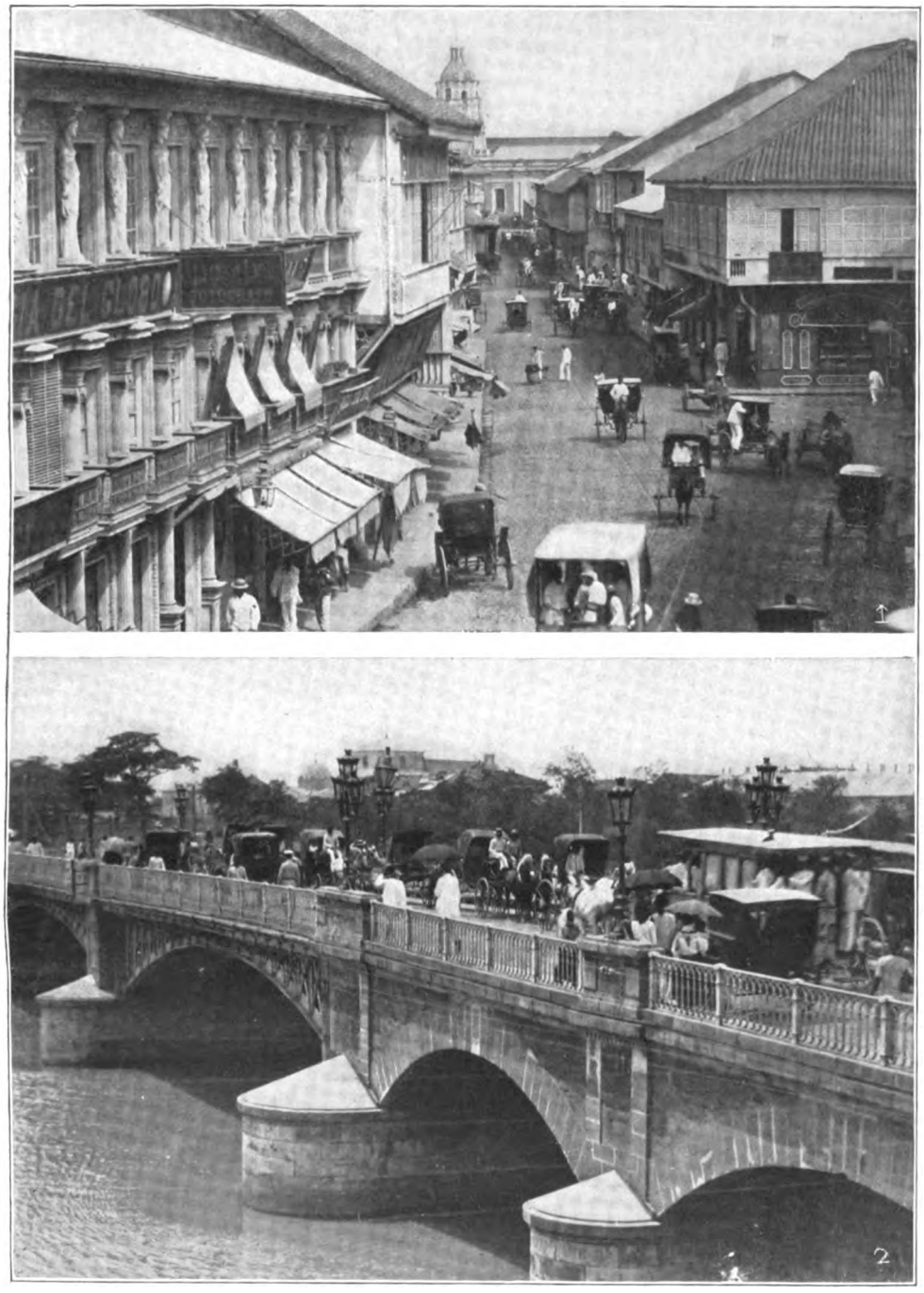
MANILA, University of, founded in 1585 by Philip II of Spain. Later branches or affiliated schools were founded in different parts of the island. A seminary for the sons of Spanish nobles was opened in 1601, and 10 years later departments were added for the sons of those not belonging to the nobility and for the natives. The university was reorganized in 1857, and again after the American occupation. The departments are science, classics, law, medicine, theology, philosophy, engineering, pharmacy, arts and music. The usual degrees are granted. In 1918 there were about 800 students in attendance.

MANILA BAY, the largest bay in the Philippine Archipelago, indenting the western central coast of the island of Luzon. Its greatest dimensions are from the minor bay of Pampanga in the northwest to Point Kalumpan on the south, about 38 miles; from the delta of the Grande de la Pampanga River southwest to Corregidor Island is 31 miles; circumference 120 miles. The entrance between Point Kalumpan and Corregidor is about seven miles in width; that between Corregidor and Marivele about two miles. There are lighthouses on either side of the larger entrance. The bay is surrounded by five provinces, and receives the waters of many rivers, including the Grande de la Pampanga, with its large delta, and the Pasig at Manila, which communicates with Laguna Bay, to the southeast, and has been dredged for navigation. The lands on both sides of the bay at the entrance are high and covered with vegetation, but the shores at the head of the bay are low and marshy, intersected by numerous small rivers, estuaries and tidal lakes. It is one of the finest harbors in the East, being free of obstructions to navigation, and affording excellent anchorage. But the water is so rough at times that it was necessary to construct large breakwaters to protect the shipping. Point Luzon is at the mouth. Submarine telegraphs are laid in the bay which run to San Francisco, to Hongkong and to Iloilo. Manila, the capital of the archipelago, and Cavite, the United States naval headquarters in the Philippines, are on its shores; an artificial port is being constructed at Manila. In this bay Admiral Dewey won a victory over the Spanish fleet 1 May 1898.

MANILA BAY, Battle of. See SPANISH-AMERICAN WAR.

MANILA HEMP, or **ABACA,** *Musa textilis.* This species belongs to the plantain or banana family, the commercial fibre being derived from the stalk or trunk of the wild plantain of the Philippine Islands, and is classed as a structural fibre. The strongest and best of our hard cordage fibres, it is employed in the United States for standard binder twine and for all sizes of rope from the smallest dimensions to hawsers and cables. The old rope and the waste are employed as paper stock. The fibre is creamy white to reddish white, lustrous, easily separated, stiff and resistant, while its

MANILA



1 La Escolta

2 The Bridge of Spain

lightness makes it advantageous for employment in cordage for the rigging and running ropes of ships. Structurally the bundles of fibres are very large, but easily separated into fibres of even diameter; the walls of the cells are of uniform thickness, growing slender toward the ends gradually and regularly. In breakage tests for textile strength, with English hemp — made by the British government — Manila stood a strain of 4,669 pounds against 3,885 pounds for hemp, ropes three and one-quarter inches in circumference and two fathoms long being used in each test. In the Philippine Islands the finer grades of the fibre are extensively used for fabric manufacture, the product being worn by the natives of both sexes throughout the archipelago. Mixed with cotton a durable fabric is produced well adapted to the climatic conditions of the islands. According to a recent report of the Philippine Bureau of Agriculture, the manila hemp plant was introduced into India in 1859 and the Andaman Islands in 1873. The plant is also said to be found in Borneo and Java, and attempts have been made to introduce it into other countries. It remains a fact, however, that the commercial fibre is produced only in the Philippines. The culture has been attempted without success in the West Indies, and seed was imported for trial in Florida only a few years ago; it was planted but it failed to germinate. Several species of banana yielding fair fibre are successfully cultivated throughout tropical and sub-tropical America, and in many other portions of the world. Banana fibre bears no comparison, however, with the Manila hemp of commerce, although the fibre of *Musa basjoo* is produced commercially in Japan where it is employed for undergarments for summer wear, as well as for light dresses for the higher classes of Japanese.

Manila hemp first attracted attention commercially early in the last century, and was imported into Salem, and Boston, Mass., about 1824; samples of the fibre, however, were brought to this country by naval officers as early as 1820. The production of the textile had reached about 8,000 tons in 1840, 30,000 tons in 1860 and 50,000 tons in 1880. In 1900 the production was nearly 90,000 tons, and at the present time (1918) is in excess of 130,000 tons. The United States in 1916 took 19,000 tons of the value of $14,067,000, and the total export was $24,974,000, or 40 per cent of the total Philippine exports.

Regarding the specific localities of production and details of cultivation, preparation, etc., the student is referred to Bulletin of the Royal Gardens Kew (August 1894), to a Descriptive Catalogue of Useful Fibre Plants of the World (Washington 1897), and to the latest issues of the *Farmer's Bulletin* published by the Philippine Bureau of Agriculture, Manila.

The extraction of the fibre is a simple proposition. The *abaca* is cut near the roots when the plant is two to four years old, and just before blossoming; if cut earlier the fibre is finer but shorter. After striking off the leaves the trunk or stem is slit from end to end, and the sheathing layers of cellular matter, which form the petioles of the leaves, are separated, dried a day or two and then cut into strips three inches wide, and finally scraped until the fibre has been cleaned of all extraneous matters, soft cellular tissue, etc. The bundles of wet fibre are shaken into filaments, washed, dried and sorted. This is the export fibre for cordage purposes, the fabric fibre necessitating further treatment by beating, which softens and subdivides the filaments. The export fibre is wrought into hanks and made into bales of about 270 pounds, when it is ready for shipment. Attempts to use machinery for extracting the fibre have not been successful, partly because the machines have not been adequate, and partly on account of native prejudice. There is a great waste by the hand methods of preparation which it is thought machine extension would obviate. See FIBRE; HEMP; JUTE; RAMIE; SISAI HEMP.

MANIN, mä-nēn', **Daniele**, Italian patriot: b. Venice, 13 May 1804; d. Paris, 22 Sept. 1857. He studied at the University of Padua, was admitted to the doctorate of laws and practised at the bar. In politics he became the leader of the liberal class, and by 1847 had secured a solid reputation as a political economist. For anti-Austrian utterances made during that year and the next he was twice imprisoned, but while awaiting trial was set free by the populace upon arrival of news of the revolution of 1848 in Italy and France, was made President of the Republic of Saint Mark and given supreme power as head of the patriotic revolt. The Austrians were driven out, and during the siege, which began in the autumn of 1848 and lasted 12 months, Manin was at the head of the civil government, and to his counsels and patriotic spirit it was mainly owing that the Venetians maintained so long and brilliant a defense. After the capitulation Manin retired to Paris, where he maintained himself by giving lessons in Italian, and continued in various pamphlets and through the press to advocate the cause of Italian independence. Consult Martin, 'Daniel Manin and Venice in 1848-9'; Mortinengo, Cesaresco, 'Italian Characters' (1901).

MANIOC, or MANDIOC. See CASSAVA.

MANIPLE, (1) one of the divisions of the ancient Roman army. It consisted of 60 rank and file, two officers called centuriones and one standard-bearer called vexillarius. (2) In the Roman Catholic ritual a sacred vestment attached to the left arm, to leave the right at liberty for ministering. See COSTUME, ECCLESIASTICAL.

MANIPUR, măn-ĭ-poor', northeast India, a thinly populated native state now more frequently called Assam State, which is confusing because there is Assam province (q.v.). It consists principally of an extensive valley situated in the heart of the mountainous country which lies between Assam, Cachar, Burma and Chittagong; area, 8,456 square miles. The greater part of the state is covered with forest and jungle, and the wild animals include the elephant, rhinoceros, tiger, leopard, bear, deer and buffalo. The people belong to the Mongolian race, and are known as Manipuris. They are governed by a rajah, at whose court resides a British political agent under the control of the chief commissioner of Assam. The capital is Manipur, also called Implial, lying in the Namkathay on Manipur River, which is tributary to the Irrawaddy, almost 250 miles north by west of Mandalay; pop. about 75,000. Most of the work is done by the Manipuri women, the men being lazy. The chief crop is rice. There is a special breed of ponies in the country, which are much

employed in the game of polo, the national sport of Manipur. There has been a political agent in Manipur since 1835. In 1891, in an outbreak headed by a member of the reigning family, the chief commissioner of Assam and the political agent were murdered; but the disturbance was soon put down and avenged. Pop. 346,222, of whom 201,369 are Hindus, 130,093 Animistic, and a few Mohammedans. Consult Johnstone, 'Experiences in Manipur' (1896).

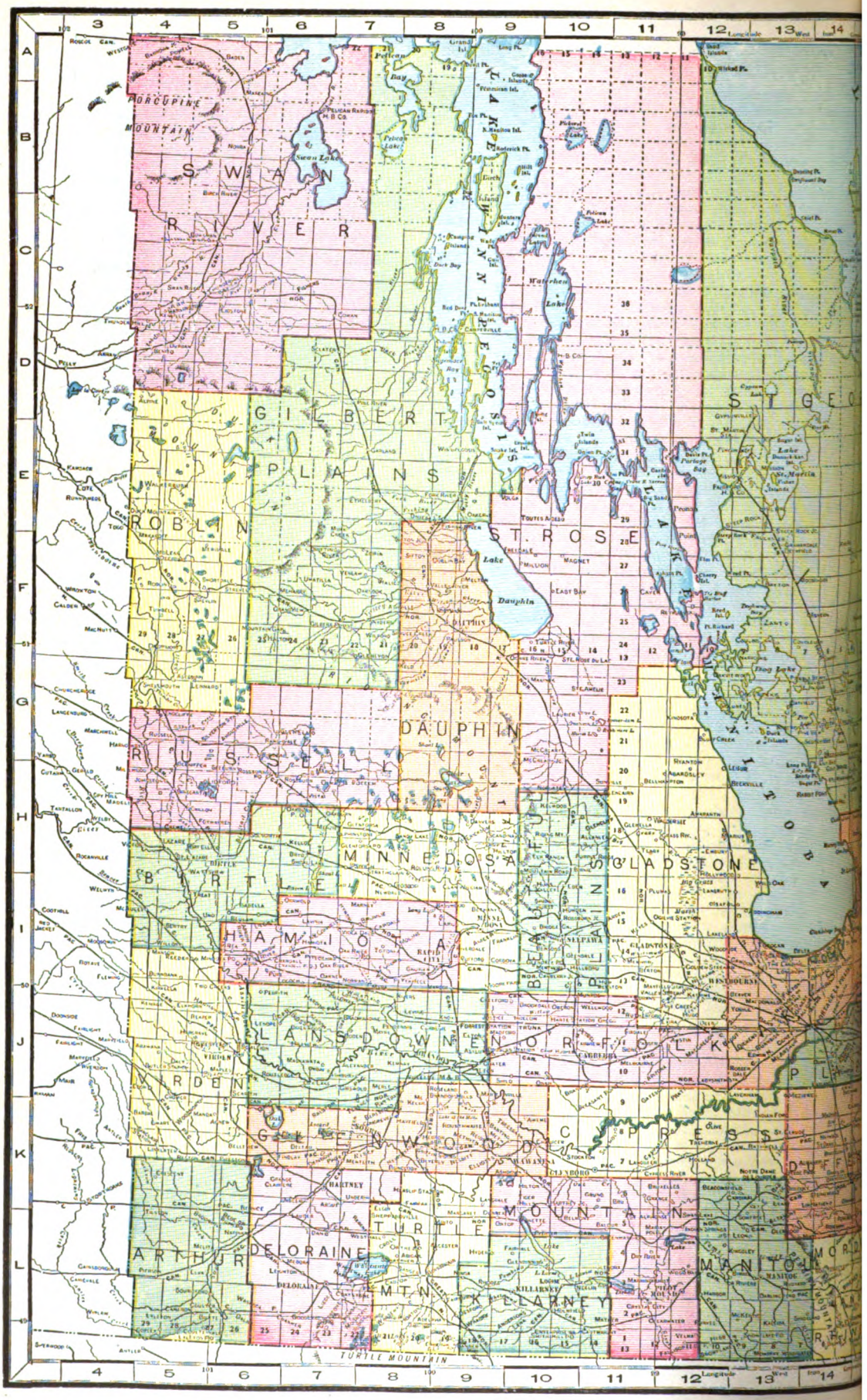
MANIS, PANGOLIN, or **SCALY ANT-EATER,** an edentate mammal, belonging to the group *Squamata,* coextensive with which is the family *Manidæ.* The body and long, thick tail are covered with horny, imbricated scales. The legs are short and very strong, and the toes are armed with powerful claws, enabling the animals to burrow rapidly. These animals can roll themselves into a ball, and are then protected by their scales, and they exhibit remarkable strength in holding their bodies in this protective attitude. The scales are regarded as formed of agglutinated hairs; and in the Asiatic species true hairs grow between the scales and extend beyond them. All dwell in burrows, come abroad only at night and subsist almost altogether on ants and termites, which they capture by means of their long, rope-like, sticky tongues. They have no trace of teeth; and in general structure show a close resemblance to the American ant-eaters. They range in size from the African *M. Gigantea,* six feet, to two and one-half feet. They are comparatively common in some rocky districts of India and China. The latest review of the family shows that it contains seven species.

MANISTEE, măn-is-tēe', Mich., city, county-seat of Manistee County, on Lake Michigan and the Manistee River, and on the Manistee and North-Eastern and the Pere Marquette railroads. A mission house is said to have been built here in the year 1826, but not until 1830 have we positive proof of the white man's presence, when a party of white men landed and proceeded up the river. In 1840 John and Joseph Stronach landed here and selected a site for a saw mill in the dense pine forest and the following spring John Stronach and his son Adam chartered a schooner, and came here with machinery, supplies and about 15 men. They arrived at the mouth of the river 16 April 1841. From that day dates the first permanent settlement of Manistee County. In 1848 a mill at the mouth of the river was built by John Canfield, and for several years thereafter business had a tendency to settle west of what is known as "the big sandhill." In 1855, by the passage of a bill in the legislature, Manistee County became organized, having the townships of Stronach, Brown and Manistee, and at the first county election 136 votes were cast. In 1861 Manistee's population numbered but 1,000 persons, and between the Civil War and a disastrous fire its progress was greatly retarded. After the close of the War things became more prosperous. In 1869 the town outgrew itself and became a city, with 3,343 inhabitants. Manistee was again visited by fire 8 Oct. 1871, and almost entirely destroyed. On the southeast is Lake Manistee, five miles in length and one and one-half miles wide. Passing through the centre of the city, a distance of one and one-half miles and uniting the two lakes, is Manistee River, 175 feet wide with a minimum depth of 12½ feet, and a current running about four miles an hour. Its waters, never closed by ice, are navigable the entire year, making the best winter harbor on Lake Michigan a shipping port. Manistee's chief industries are the manufacture of salt and lumber. Underlying here at a depth of more than 1,900 feet is a strata of rock salt 32 feet in depth, and from wells 2,000 feet deep, with an opening of but six inches in diameter, is pumped brine, from which immense quantities of salt are manufactured. About 2,500,000 barrels of salt are shipped from here annually. Lines of passenger steamers connect the city with Chicago, Milwaukee and points north and south. There are two telegraph lines, a telephone exchange, a system of waterworks, with over 30 miles of mains, an electric street railway, over 50 miles of streets, daily papers and weeklies, one of which is printed in German. There are six modern and well-equipped public school buildings, and six parish schools, a Carnegie library, 16 churches and one mission. Orchard Beach, situated two and one-half miles north of the city, is one of Manistee's chief beauty spots. Among the attractions of this park is a theatre 70 x 102 feet, which seats comfortably about 700 persons. Reitz Park is on a high bluff overlooking Lake Manistee.

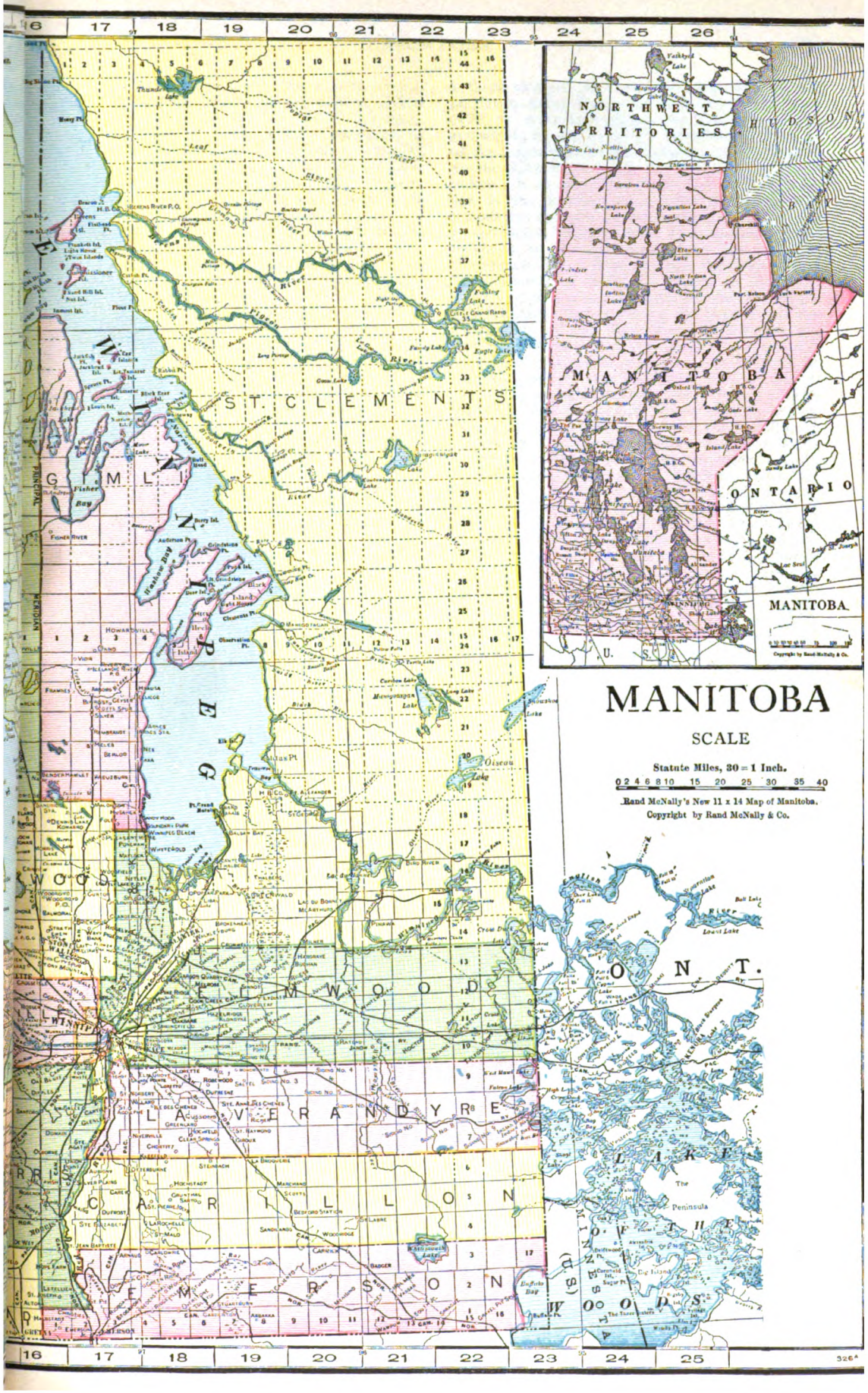
Suburbs.—Situated on Lake Manistee are Oak Hill, Filer City, Stronach, Eastlake and Parkdale. In 1914 the commission form of government was put in operation. Population of Manistee is 12,381, including suburbs, 18,073.

MANISTIQUE, măn-is-tēk', Mich., city, county-seat of Schoolcraft County, at the northern end of Lake Michigan, at the mouth of the Manistique River, and on the Manistique and Northern and the Minneapolis, Saint Paul and Sault Sainte Marie railroads, about 75 miles southeast of Marquette. It is in the vicinity of the forests which furnish considerable of the marketable lumber. Iron ore and limestone are abundant in this region. The chief manufacturing establishments are foundries, lime-kilns, lumber mills, chemical works and distilleries. Charcoal is one of the important products made just outside the city, and fishing is a prominent industry. Lake West Manistique is near by. The opportunities for trade are excellent, and Manistique is a commercial centre for a large portion of the Upper Peninsula. The city was incorporated in 1901, has good public and parish schools and a public library established in 1894. Pop. 4,400.

MANITOBA, măn'i-tō'bä, Canada, occupies among the provinces of the Dominion a central position between the Atlantic and Pacific. It extends from the international boundary line on the south to the 60th parallel of north latitude on the north. It is bounded on the west by the province of Saskatchewan and on the east by Hudson Bay and the province of Ontario. It thus lies between the 49th and 60th parallels of north latitude and the 89th and 102d meridians of west longitude. The maximum length of the province north and south, 760.65 miles, the maximum breadth east and west, 495 miles. The present area is computed at 251,832 square miles, of which 19,906 are water. Pop. (1870) 11,963; (1881) 62,260; (1891) 152,506; (1901) 255,211; (1911) 461,630;



SWAN RIVER
GILBERT PLAINS
ROBLIN
ST. ROSE
DAUPHIN
RUSSELL
MINNEDOSA
GLADSTONE
BIRTLE
HAMIOTA
BEAUFORT PLAINS
LANSDOWNE
NORFOLK
VIRDEN
GREENWOOD
CYPRESS
MOUNTAIN
TURTLE
ARTHUR
DELORAINE
MTN.
KILLARNEY
MANITOU
PORCUPINE MOUNTAIN
LAKE WINNIPEGOSIS
LAKE MANITOBA
Lake Dauphin
Swan Lake
Pelican Bay
Waterhen Lake
Dog Lake
TURTLE MOUNTAIN


NORTHWEST TERRITORIES
HUDSON BAY
MANITOBA
ONTARIO
U. S. A.
MANITOBA
ST. CLEMENTS
GIMLI
EDEN
WOODLANDS
ELMWOOD
LAVERANDRYE
CARILLON
EMERSON
ONT.
LAKE OF THE WOODS
The Peninsula
Lake of the Woods
Rainy River
Lake of the Woods
Winnipeg
Lake Winnipeg
Lake Manitoba
Lake Winnipegosis
Red River
Assiniboine River
Winnipeg River
Whiteshell Forest Reserve
Riding Mountain Forest Reserve
Duck Mountain Forest Reserve
Spruce Woods Forest Reserve
Turtle Mountain Forest Reserve
Pembina Mountain
Pembina Hills
Brandon Hills
Tiger Hills
Pembina Mountain
Pembina Hills
Brandon Hills
Tiger Hills
Riding Mountain
Duck Mountain
Spruce Woods
Turtle Mountain

(1916) 553,860. Winnipeg, the capital (q.v.), has a population (quinquennial census, 1916) of 163,000; Brandon, 15,215; Saint Boniface, 11,021; Portage la Prairie, 5,879. Population by religious denominations: Presbyterian, 122,174; Anglican, 107,150; Roman Catholic, 97,005; Methodist, 71,371; with the Greek Church, Lutheran, Mennonite, Jewish and Baptist (in the order named) in smaller numbers.

Boundaries.—The district of which the junction of the Red and Assiniboine rivers—now the city of Winnipeg—has always been the nucleus since the period of settlement began in 1812 has been subject to no fewer than six changes of boundary. (a) The grant of Assiniboia made by the Hudson's Bay Company to Lord Selkirk in 1811 comprised 116,000 square miles from 52° 30′ N. latitude (passing through Lake Winnipeg) on the north to the "height of land" between the northern and Mississippi watersheds on the south and from Lake Winnipeg and the Winnipeg River system on the east to about 102° W. longitude. The southern portion of this was found to be south of the international boundary after the Treaty of Ghent. (b) In 1841 the "Municipal District of Assiniboia" was declared to extend "in all directions 50 miles from the forks of the Red River and the Assiniboine." (c) In 1870 at the transfer of the Hudson's Bay territories to Canada, the new province of Manitoba extended from the international boundary to 50° 30′ N. latitude and from 96° to 99° W. longitude. From its limited area and shape it was long known as "the postage stamp province." (d) In 1877 the eastern and western boundaries were slightly changed from meridians of longitude in order to conform to the system of land surveys in township, etc. (e) In 1881 the province was enlarged westward to the 30th range (nearly 101° 31′ W. longitude), northward to the 12th base line (nearly 53° N. latitude) and eastward almost to 95° W. longitude, though this was fixed only after extended litigation with Ontario in 1884. The area was now 73,732 square miles. (f) In 1912 the province was enlarged north and northeast to the present boundaries, including a littoral of 500 miles on Hudson Bay and about 178,000 square miles of new territory. The northern boundary is now 60° N. latitude and Hudson Bay and the northeastern boundary runs from the northeast angle of the old province to the eastern end of Island Lake, and thence to the shores of Hudson Bay at the 89th meridian of W. longitude.

Geographical Position and Climate.—The importance of this district has been determined throughout its history largely by geographical considerations. For the French fur-trade from Canada and for the British trade from the same source after 1763, the Winnipeg, Red and Saskatchewan river systems formed the links between the Great Lakes and the Athabaska fur districts. Meanwhile from 1670, the date of the Hudson's Bay charter, to the transfer of the Hudson's Bay territories to Canada in 1870, the fur-trade by way of Hudson Bay came to follow the Hayes River route to Lake Winnipeg, thence the Red and Saskatchewan Rivers to the areas south and west. The intersection of these two channels occasioned the long and bitter conflict between the Hudson's Bay and North-West companies. With American expansion up the Missouri and Mississippi rivers a third channel of communication was opened up from Saint Paul—at first by "Red River cart" or river-boat down the Red River, and eventually by rail in 1878. With the completion of the Canadian Pacific Railway, traffic reverted to the Canadian route by rail or the Great Lakes. It is seen therefore that the province lies at the headwaters of the three greatest waterways systems of the continent, the eastern by the Great Lakes and the Saint Lawrence, the southern by the Mississippi and the northern to Hudson Bay. This strategic importance was the occasion of Selkirk's choice of this district for colonization in 1811, for the movement in the United States during the sixties for the annexation of the Red River district to the American Union and for the more successful movement in Canada culminating in 1870 in the incorporation of the Hudson's Bay territories into the Canadian Confederation. Recent developments tend to confirm these considerations. The resources of water power, the fertility of the prairie and the prospective maritime outlet on Hudson Bay almost from the centre of the continent (see *Resources*) tend to unite the interests of the factory, the prairie and the sea at a point where the distinctive interests of East and West begin to diverge. On account of "its geographical position and its peculiar characteristics" Lord Dufferin in 1877 referred to the province of Manitoba as the "keystone of the arch." The position of Winnipeg (q.v.) as "the neck of the funnel" for traffic converging eastward and diverging westward has made that city the largest cash wheat market on the continent, with bank clearings normally equalled in Canada only by those of Montreal and Toronto.

The climate exhibits high variability of temperature, both daily and seasonal, together with a good average temperature for the year. The humidity, however, particularly in winter, is low. For the 20-year period, 1888–1907 at Winnipeg the mean daily range of temperature has varied from the maximum of 26.4° for May to the minimum of 18.1° for November. The mean annual range of temperature has been 68°, though the highest absolute range of temperature recorded has been 153°. The highest mean monthly temperature has been 77.6° in July, the lowest —13.4° in February. The annual rainfall has averaged 20.42 inches, but it is a remarkable fact that 10.9 inches of this have fallen during the four months May to August. The percentage of possible sunshine during the same period has averaged about 55.5 per cent—nearly double that of Edinburg. The growth of vegetation is thus remarkably rapid. The climate is healthful and invigorating, though the winters are severe and the changes from winter to summer and vice-versa are unusually sudden.

Geology and Topography.—The geological formations encountered in Manitoba are Precambrian, Ordovician, Silurian, Devonian, Cretaceous, Pleistocene and Recent. Of these the early formations are found in ascending order from east to west, except that in the northeastern angle of the province adjacent to Hudson Bay there is a belt of Silurian with another of Ordovician adjoining it. The Precambrian area, comprising practically the whole district east and southeast of Lake Winnipeg, extends roughly in a northwesterly direction, including

nearly the whole of the central and northwestern part of the province. Outcroppings of Huronian and Keewatin are numerous (see *Resources*) though but limited areas have been as yet carefully prospected. The topography of this Archæan region is very rugged with numerous lakes and wooded ridges of granites and gneisses largely denuded of soil by glacial action. The term "prairie province" long applied to Manitoba thus applies only to the southern and southwestern areas of the province, comprising less than two-fifths of the whole. The Ordovician, Silurian and Devonian belts, extending also in a general northwesterly and southeasterly direction, underlie the great lake districts of Lakes Winnipeg, Manitoba, Dauphin and Winnipegosis. Valuable limestone, gypsum, shale and sandstone deposits outcrop at many points over these areas (see *Resources*). The Cretaceous area directly overlying the Devonian in the southwestern district of the province exhibits soft shales and basal sandstone. The escarpment which forms the eastern edge of this area extends from the Pembina Mountains, near the international boundary, to the Pasquia Hills just south of the Saskatchewan River. The Pleistocene deposits of clay over the older formations, particularly in the south, are due, like the highly composite nature of the surface soils of this area, to the action of the great glacial lakes Agassiz, Souris and Saskatchewan — probably 110,000 square miles in area (Upham) of which considerably more than three-quarters lay within the present boundaries of the province. The original outlet of this great lake, the receding shores of which are marked by no fewer than 28 beaches (Upham), was toward the south until the melting of the ice-barriers opened up the natural outlet into Hudson Bay. To the rich composite deposits of surface soils during this process, particularly where the early recession of Lake Agassiz permitted adequate "weathering" of surface molds, the fertility of southern Manitoba may largely be attributed, though more recent alluvial deposits of both clay and humus are traceable in the Red River Valley. In the northern areas of the Lake Agassiz district the drainage is still very defective and the "weathering" of the soil correspondingly incomplete.

Perhaps the most striking topographical feature of the province is the surviving lake area of Lakes Winnipeg, Manitoba, Dauphin and Winnipegosis. Lake Winnipeg particularly (approximately 9,500 square miles) is the repository of the Winnipeg River system from the southeast, the Red and Assiniboine River systems from the south and the Saskatchewan River system together with the Winnipegosis, Manitoba and Dauphin Lakes system from the west. The outlet is by Nelson River into Hudson Bay. The Churchill River flowing also into Hudson Bay drains a largely unexplored area in the northwestern part of the province. This variety of surface features is found with a very limited range of altitudes. The highest hills are found in the escarpments of the Cretaceous area — Pembina Mountains, Tiger Hills, Riding Mountain, Duck Mountain (2,600 feet) and the Pasquia Hills.

Fauna and Flora.— The wild life was at one time prolific and is still justly famous, though game is now carefully conserved. The fur-trade was the first historic industry of the country. The buffalo, once found in almost incredible numbers on the prairie, is now extinct in its wild state, but the wapiti or elk, the antelope and the moose are still plentiful. Among fur-bearing animals are the otter, beaver, mink, fisher, skunk, martin, muskrat, wolf ("timber" and "prairie"), bear, fox, lynx, ermine and wolverine, with the rabbit in great abundance as the basis of carnivorous life. Bird life is plentiful, including prairie chicken, wild duck, mallard duck, wild goose and partridge among game birds, and more than 250 other species of wild birds. Among fish the whitefish, pickerel, pike, sturgeon, tullabee and goldeye have considerable commercial value.

The flora of the province includes tamarac, spruce (white and black or "bog"), jack pine, trembling poplar and balsam fir over vast areas of the Precambrian district, with less plentiful growths of oak, elm, cottonwood and "Manitoba maple" in southern districts of the province. Small fruits such as strawberry, raspberry, blueberry, cranberry ("high-bush" and "low-bush"), saskatoon berries, the wild plum, cherry and black currant are indigenous. Wild flowering plants (more than 750 species of Phanerogamia) are remarkable during the summer months for their profusion of variety and color.

History and Political Development.— Manitoba was admitted as a province to the Canadian Confederation only in 1870, but there is a sense in which the Hudson Bay district is the oldest continuously British territory upon the continent. The charter granted to the Hudson's Bay Company in 1670 formed the basis of the British claims which came to embrace practically the whole watershed into Hudson Bay. French counterclaims on behalf of Canada, however, were advanced and in many cases vindicated by force until 1713 when the district became British by the Treaty of Utrecht. Provision was made for a commission to determine the boundaries between Canada and the Hudson's Bay territories, but no settlement was ever reached. After Canada also became British in 1763, traders from Montreal under the name of the North-West Company sought to revive the validity of the old French claims in order to vindicate their refusal to recognize the Hudson's Bay charter. This conflict in trade was accentuated rather than assuaged when the fifth Earl of Selkirk obtained control of the Hudson's Bay Company in 1811 in order to carry out his third project of colonization from the Scottish highlands. The company granted him for the purpose the district of Assiniboia, comprising 116,000 square miles and controlling the most important strategic waterways of the west. The first band of settlers reached "the Forks" of the Red and Assiniboine rivers, the site of the city of Winnipeg, on 30 Aug. 1812. From the first, however, the North-West Company had determined to disperse or destroy the settlement, and faulty management on the part of the officials of the colony facilitated their purpose. In 1815, 134 of the settlers were induced to leave the Red River Settlement for Upper Canada. The rest were driven off toward Hudson Bay. Reinforcements re-established the colony in the autumn, but in the following spring Governor Semple and 20 of his men were killed at Seven Oaks, near the settle-

ment, by an armed band of "half-breeds" or Métis in the employ of the North-West Company. This act of violence at last aroused the British government from its policy of "salutary neglect," but Selkirk, who was on his way from Canada to the settlement when he received the news of Seven Oaks, made the fatal mistake of turning aside to retaliate upon the North-West partners at Fort William. The rest of his life was filled with bootless litigation; for though he visited the settlement in 1817 and spent both health and fortune upon it, he died in 1820 without vindicating his cause. Meanwhile the British government had brought pressure to bear in order to bury the blunders of the past by a coalition between the rival companies. This was effected in 1821 under the name of the Hudson's Bay Company, and the old "North-westers" became the stunchest exponents of all the rights of the charter.

The Red River Settlement, meanwhile, had suffered a series of natural as well as deliberate calamities. A plague of grasshoppers in 1818 and finally the great flood of 1826 threatened, as Governor Simpson wrote, to prove "an extinguisher to the hope of Red River ever retaining the name of a settlement." The colony was firmly re-established, however, by a succession of prolific harvests and the profusion of natural resources for primitive settlement. (Sheriff Ross records the slaughter of 2,500 buffalo in a single "hunt," and no fewer than 16,000 whitefish were taken by the settlers on their retreat after Seven Oaks). By 1830 the Red River Settlement bore every appearance of "peace and plenty." In 1834 it reverted by purchase from the Selkirk family, in whose possession it had remained after the fifth Earl of Selkirk's death, to the direct control of the Hudson's Bay Company.

After the coalition in 1821 the company's trade in Rupert's Land, as the "chartered" territory came to be called, had responded rapidly to the enterprising management of Gov. George Simpson. By license issued successively in 1821 and 1838, for periods of 21 years, the company was granted a monopoly of the fur-trade for the whole district westward to the Pacific. A new Fort Garry with walls and bastions of stone was built at "the Forks" (1836–38) but the Red River Settlement remained for more than a generation a primitive and secluded community. The primitive "council" at the settlement gave place after 1834 to the regularly constituted "Council of Assiniboia." After 1841 the "Municipal District of Assiniboia" came to include only the area within a radius of 50 miles from "the Forks" of the Red River and the Assiniboine. Colonization was overshadowed by the opulence and mystery of the fur-trade, and though the company can scarcely be charged with neglect, Selkirk's original plan of affording a stable and ready market for agricultural produce in the expanding trade of the company was only partially realized. With the advent of the American trader from the south and the enterprise of the "free-traders" within the settlement itself, even the company's cherished monopoly of the fur-trade was subject to challenge.

The original Scottish settlers, reinforced by many of the retiring servants of the company, formed a thrifty and contented community. The French Métis, however, though served by a devoted Roman Catholic priesthood, formed a much less stable element of the population. Accustomed to live by the buffalo chase or by fishing, they were readily susceptible to influences with which the primitive patriarchal authority of the company soon proved powerless to cope. The process of "smoothing" the malcontents by adroit management postponed the conflict without averting it. In 1849 the primitive judiciary at the settlement was openly intimidated into acquitting one of the "free-traders" in furs. Thereafter the monopoly of the fur-trade was openly contravened. The Red River Settlement began to attract attention in Canada and in the United States. In 1857 the Committee of the British House of Commons drew up its famous '*Report*' on the Hudson's Bay Company, and it became apparent that Canada had the ear of the British government in the dream of expansion to the Pacific.

From 1857 to the transfer of the Hudson's Bay territories to Canada in 1870, the development of the Red River Settlement was rapid and at times turbulent. During 1856 no fewer than 500 Red River carts with produce and furs plied to the American outposts. Three years later two Canadian journalists brought in a printing-press, and the *Nor'-Wester* advocated insistently a union with Canada. American opinion was scarcely less pronounced; as late as 1869 Governor McTavish of the Hudson's Bay Company regarded annexation to the United States as the "manifest destiny" of the Red River district. The Canadian party, however, though enterprising and aggressive, bitterly antagonized the company and many of the older inhabitants. The improvident and credulous French Métis, particularly, were suspicious and resentful. Generous "reserves" of land and scrupulous tact on the part of Canadian officials might have allayed their fears of the impending change. In 1869 the purchase of the Hudson's Bay territories by Canada for £300,000 ($1,500,000) was arranged under the auspices of the British government. The company had changed hands in 1863, and the resident officials in Rupert's Land could not be expected to be enthusiastic either to the new directorate or to Canada. The Scottish settlers readily acquiesced in the change, but the fears of the French Métis were fomented by a few agitators into open insurrection against the transfer.

The Dominion of Canada had been formed only in 1867, and the Riel Insurrection at Red River reflected largely the attitude of Quebec in the Canadian Confederation. The establishment of a smaller Quebec on the banks of the Red River had long been the policy of the French clergy. The prospect of union with Canada without guarantees for their race, language and religious control over the Métis occasioned the bitterest resentment. During Archbishop's Tache's absence from Red River a rising of Métis led by Louis Riel received the support and for a time submitted largely to the guidance of French clerical influence in touch with Canadian politics. Riel seized Fort Garry and dominated the settlement for 10 months until the arrival of a military expedition under Colonel Wolseley on 24 Aug. 1870. "Land scrip" was issued for the Métis, and clauses intended to safeguard the French language and separate schools found their way into the Manitoba Act by which the province was formally

incorporated into the Dominion; but the violence of Riel and his confederates, and particularly the violent death of Thomas Scott, a Canadian, on 4 March 1870, embittered provincial and even federal politics for many years. The ruthless repeal of these special privileges for the French minority 20 years later was due in no small measure to resentment against the methods employed in seeking to obtain them during the Riel Insurrection. The total population of the new province was less than 12,000, of whom but 1,565 were white. The first provincial government consisted of a legislative assembly of 24 members (with an executive council of five) and a legislative council (abolished in 1876) of seven members. The new province inherited from the past a series of problems which kept public feeling at high tension. Cross-currents of race and religion — a Fenian raid in 1871, the "amnesty question" and the trial of Lépine for the death of Scott — complicated for many years the work of provincial government. The chronic poverty, moreover, of the "postage stamp province" reduced administration after administration to a degree of economy bordering upon parsimony. The agitation for "better terms" and "provincial rights" became increasingly insistent with the responsibilities attendant upon rapid immigration. Within a decade the population grew from 12,000 to 60,000. The railway from Saint Paul was completed in 1878; with the Canadian Pacific Railway in prospect east and west the province began in 1879 to experience a "boom" which added $5,000,000 in buildings and doubled the population of Winnipeg within a single year. After 1882 the return to normal conditions was slow and difficult. Under the Norquay administration particularly (1878–87) the provincial government was found to be struggling against intolerable disabilities. The control of natural resources had been retained by the federal government. The provincial treasury was dependent chiefly upon meagre grants from the Dominion under the form of direct allowance for government, per capita allowance for institutions, "debt allowance" for Dominion indebtedness in 1870, subsidy in lieu of public lands, etc. The national importance of the Canadian Pacific Railway was held to justify "a monopoly clause" against the granting of provincial charters to competing railways. The grant of one-twentieth of settled land to the Hudson Bay Company by the terms of the transfer in 1869 and the generous grants of land to the Canadian Pacific Railroad had created a "land-lock" which interfered seriously with settlement. An increase of federal subsidy to $227,000 in 1882 and the extension of the boundaries proved quite inadequate concessions. The Canadian Pacific Railroad was completed in 1885 but the province proceeded to contest the "monopoly clause" by undertaking the Red River Valley Railway as a government work. The new Greenway administration (1888–99) forced the Dominion at last to repeal the objectionable "monopoly clause." This first substantial victory for "provincial rights" was regarded as "the advent of a new era."

"The Manitoba School Question" which dominated provincial politics and eventually even federal politics in 1896 is dealt with elsewhere. The Roblin administration, from 1900, was marked by few fundamental political issues. In 1908 the government announced "the first complete system of government-owned telephones on the continent." Four years later it was announced that there were nearly 4,000 miles of completed railway lines within the province, of which about 1,600 miles had been built in seven years. Provincial guarantees of railway bonds ($25,000,000) have since been practically abrogated by the Dominion (1918) in taking over the Canadian Northern Railway. In 1912, almost exactly a century after the beginning of settlement in Assiniboia, the boundaries of the province were extended northward over a new district estimated at 106,304,000 acres, with a littoral of 500 miles on Hudson Bay (see *Boundaries*). The sum of $2,178,648 was granted for arrears of claims by the province, and the total federal subsidies were increased from less than $840,000 in 1911 to nearly $1,350,000 pending the control of the natural resources by the province. The Norris administration which was strongly supported at the polls after the resignation of the Roblin government in 1915 is carrying forward a very comprehensive policy of education. The Hudson Bay Railway for which $25,000,000 have been appropriated by the Dominion is now under construction from The Pas to Port Nelson — 410 miles, of which 320 have been completed. For the province of Manitoba, the prospect of a shorter water route to the British market, for at least four months of the year, than that from New York, marks a curious recurrence to historic conditions. Not less important will be the prospect of opening up — eventually under provincial control — the natural resources of the vast northern areas of the province. The chief interests of Manitoba, however, remain agricultural. By far the most remarkable development of recent years in western Canada has been agrarian organization — the Manitoba Grain Growers' Association with similar organizations in other western provinces — for co-operative and educational purposes. The United Grain Growers, Limited (an analogous commercial organization formed in 1917 by the union of the Grain Growers' Grain Company and the Alberta Co-operative Elevator Company), with headquarters in Winnipeg, has achieved by far the most signal success in Canada both in the marketing of wheat and in the purchasing of agricultural supplies through co-operative agencies.

Natural Resources, Manufactures and Transportation.— The following official statistics will indicate the relative returns from natural resources (as tabulated for 1916 by Commissioner Wallace of northern Manitoba), the estimated value of manufactures and the railway mileage within the province:

Natural Resources:		
Agriculture:	Field Crops	$76,749,000
	Live Stock Sold	11,326,457
	Produce Sold	13,212,607
Water Power		5,129,789
Mining (non-metallic)		1,823,576
Forest Products		1,807,320
Fur and Game		1,684,474
Fisheries		1,390,002
Manufactures (Census, 1911):		
Capital		47,941,540
Output		53,673,609

Railway mileage (1916, exclusive of Hudson Bay), 4,310 miles.

Agriculture is by far the chief productive

industry of the province, representing 89.5 per cent of total production from natural resources. The wheat of Manitoba, grown chiefly in the southwestern areas of the province (maximum production 96,662,912 bushels in 1915), is justly famous, giving its name ("No. 1 Manitoba hard") to the highest "contract" grade of wheat fixed by statute, though the next grade (No. 1 Northern) has now become the standard of value. Oats, barley (maximum production 101,077,991 and 35,423,495 bushels respectively in 1915), potatoes, rye and flax come next in value. It is estimated that only about 7,187,737 acres (census, 1916) or less than one-twenty-second of the total land area of the province have as yet been brought under cultivation. The yield for garden vegetables is prolific. Stock raising and mixed farming are on the increase; the numbers of horses, milch cows, sheep and swine showing an increase of 20.8 per cent, 32 per cent, 105.7 per cent and 17 per cent respectively for 1911–16. Manitoba contains nearly 4,000,000 horse power of available water power (Commission of Conservation) of which 2,904,500 is on the Nelson River and 555,900 on the Winnipeg River. Of this only 76,200 horse power from the Winnipeg River has as yet been developed, chiefly by the Winnipeg Electric Railway Company (Pinawa Channel) and the city light and power (Point du Bois). With the exception of building materials, brick, cement, building stone (Tyndall stone is pre-eminent), gypsum, etc., of the southwestern areas of the province, mining, like the water power, is as yet in its infancy. Vast districts of the Precambrian area which comprises three-fifths of the province have yet to be prospected, though deposits of copper and gold in Keewatin-Huronian formations are awaiting facilities for transportation and treatment. Upon conservative estimates (Wallace) the Hudson Bay Railway to Port Nelson following the course of the chief water powers of the province (Nelson River) is opening up a field for metallurgical and other processes such as electric smelting and the manufacture of fertilizers from limestone and atmospheric nitrogen by the electric process.

The chief manufacturing industries of Manitoba as yet are grain and meat products, electric power and products of lumber, brick and tile. The total output for 1915 was estimated at $61,594,284, an increase of 118 per cent in 10 years. The Dominion now controls more than half the total railway mileage of the province.

Government and Judiciary.— The provincial government consists of a legislative assembly of 49 members with an executive council of seven members directly responsible to the legislature. A lieutenant-governor is appointed by the Dominion for a term of five years. The legislature for which both men and women are eligible is elected for a period of four years unless dissolved in conformity with principles of British parliamentary procedure. The province has a representation of 14 members in the Dominion House of Commons, based *pro rata*, like that of other Canadian provinces, upon the fixed number of 65 from the province of Quebec.

The judiciary comprises (a) the Court of King's Bench, consisting of a chief justice and five puisne judges with original civil and criminal jurisdiction, and until 1906 with jurisdiction also, when sitting *en banc*, as the ultimate court of appeal. (b) In 1906 a Court of Appeals was established, consisting of a chief justice and four (originally three) puisne judges with appellate jurisdiction from other courts of the province. (c) County Courts in the various judicial districts of the province, with jurisdiction over certain civil (in general up to $500) and criminal cases. (d) Surrogate Courts, one in each judicial district of the province. The County Court judge is ex officio judge of the Surrogate Court, with jurisdiction over administrations and probate. Minor courts in the province are presided over by stipendiary magistrates and justices of the peace.

Education.— Manitoba possesses, under the control of a Minister of Education, assisted by an Advisory Council, a comprehensive system of non-sectarian public education from the primary school to the provincial university, including among other progressive features compulsory education, consolidated schools, residences for teachers in 127 outlying districts of the province, special school organization under an official trustee for communities of "new Canadians," night schools and two well-equipped technical high schools in Winnipeg, etc. The total annual expenditure upon public education (Report, 1917) was nearly $6,000,000, of which $1,072,816 was contributed directly by the provincial government. In the public school system in 1917 there were 106,588 pupils enrolled, with an average attendance of 64.93 per cent daily and of 135.05 days during the year. (The average for Wisconsin during 1914 was 123.4 and for the United States 117.8). There were 3,024 teachers and 1,626 school buildings. Of these more than 100 were secondary, high or collegiate schools.

The University of Manitoba is under the management and control of a board of governors consisting of nine members appointed by the provincial government, three each year for periods of three years. The university gives instruction and grants degrees in arts, science, agriculture, engineering (civil and electrical), medicine, pharmacy, law, architecture and home economics. Well-equipped agricultural and medical colleges are in affiliation with the university, together with four affiliated denominational colleges (Anglican, Roman Catholic, Presbyterian and Methodist) with representatives (two each) upon an academic council of 28 members. A Baptist college at Brandon is not affiliated with the provincial institution. At the outbreak of the war there were 917 students registered for instruction at the university.

Bibliography.— Documentary authorities 'Selkirk Papers' (manuscripts), (Dominion Archives, Ottawa); 'Papers Relating to the Red River Settlement' (1819); 'Report of Select Committee' (1857); 'Recent Disturbances' (1870); 'The Canadian North-West,' ed. Oliver (Dominion Archives, 1915). Consult also 'Canada and Its Provinces' (Vol. XIX and XX); Ross, 'Red River Settlement' (1856); Hargrave, 'Red River'; Martin, Chester, 'Selkirk's Work in Canada'; Begg, 'History of the North-West'; Bryce, 'Manitoba'; Schofield, 'Story of Manitoba.'

CHESTER MARTIN,
Professor of History, University of Manitoba.

MANITOBA, Canada, a lake situated in Manitoba province, to which it gives its name, about 59 miles southwest of Lake Winnipeg. It is of irregular shape, 119 miles long, with a maximum breadth of 29 miles, a shore-line of 535 miles, an area of 1,171 square miles and an average depth of 12 feet. It is 810 feet above sea-level, and 40 feet higher than Lake Winnipeg, into which it drains through the Saskatchewan or Dauphin River.

MANITOBA, University of. The Canadian province of Manitoba, which was formed out of Rupert's Land in 1870, was the outgrowth of the Red River Settlement founded by Lord Selkirk and his immigrants under Hudson's Bay Company auspices in 1812–15. The Scottish settlers were joined from time to time by the Métis, the descendants of French-Canadian voyageurs, who married Indian women, and also by the children of company officers and Orkney employees of the Hudson's Bay Company who had taken Indian wives. This mixed community in 1870 numbered 12,000 souls.

To the Métis came from Lower Canada Priest (afterward Bishop) Provencher, who in 1818 established a school, which grew in later times into Saint Boniface Roman Catholic College. The English-speaking half-breeds belonging to the Church of England were educated at Saint John's College, which was reorganized in 1866 by Bishop (afterward Archbishop) Machray. Just as the new province of Manitoba was forming there was established during the year 1871 in Kildonan, near Winnipeg, among the Selkirk Scottish settlers, a Presbyterian college, known since as Manitoba College. This last-named college was in 1874 removed to Winnipeg. These three denominational colleges were all in or near the new city. In 1875 an important meeting was held in the courthouse, Winnipeg, by Manitoba College, in which a union of the three colleges under a provincial university was suggested. Governor Morris favored this plan, and in 1877 an act was passed in the legislature of Manitoba establishing the University of Manitoba, to which the three colleges, Saint Boniface, Saint John's and Manitoba, were affiliated. The university was at first to be only an examining body, the teaching being done entirely by the colleges.

The new university was unique. It brought together the largest religious bodies of the province and kept up the standard of education, it being the only source of degrees. Its first examinations took place in May 1878, when seven candidates presented themselves. In 1878 application was made to the Dominion government for a land grant, and at length, in 1885, under the «Better Terms Settlement» of that year, 150,000 acres of good agricultural wild land was given to the university. This endowment is now valued at $1,250,000. In 1883 a native of Red River Settlement living in England, Mr. A. K. Isbister, who like many others was attracted by the broad and cosmopolitan spirit of the young university, bequeathed $83,000 as a scholarship fund to the university.

In 1882 the Manitoba Medical College was founded and became affiliated to the university. In 1888 a new member of the sisterhood of Colleges — Wesley College of the Methodist Church — was affiliated to the university; a college of pharmacy was affiliated in 1902.

In 1893 the University Act was changed to allow teaching to be done by the university in natural science, mathematics and modern languages, the affiliated colleges taking up the other departments. In 1898 a site of seven acres in the heart of Winnipeg, valued at $120,000, was given by the Dominion government to the university, and in 1900 the first building was erected.

In recent years on the erection of new government buildings, two commodious law buildings contiguous to the university grounds have been transferred to the university for its increasing needs. In 1903 the University Act was changed to permit teaching in the classics, natural science, mathematics and modern languages, engineering and business training, still depending on the denominational colleges for teaching in the other arts subjects. Degrees are now given by the university in arts, law, medicine and agriculture. The several affiliated denominational colleges have the power to bestow degrees in theology on students who have passed certain arts requirements in the university. These degrees on being reported to the university become as also pharmacy and dentistry ipso-facto degrees of the university.

In the first decade of this century an agricultural group of buildings was erected on a site contiguous to Winnipeg costing some $4,000,000. On a provincial farm this cluster is equipped under a large staff representing the many phases of agriculture. It is said that this complete group is not surpassed by any set of similar buildings on the continent. The Manitoba Agricultural College is affiliated to the university. A university library growing to be worthy of recognition is now established in the university.

In the last decade of its history a very large addition has been made to the work of the arts and sciences in the university, including a law school, to civil, electrical and mechanical engineering departments, and to the branches of pharmacy, commercial education and architecture. There are upward of 50 instructors now on the university faculty.

Not only has this great development taken place in the University of Manitoba, but it is to be remembered that in less than two decades three provincial universities of western Canada, viz., those of Saskatchewan province at Saskatoon, of Alberta at Edmonton and of British Columbia at Vancouver, have been established and are developing greatly, thus cutting off a vast field of supply from Manitoba University. Under the new act of 1917 Manitoba University has become strongly supported by the provincial government, and still retains the support of the denominational colleges, which cling to their former affiliation. Notwithstanding the great demands of the European War, the number of university students in the year 1917–18 reached 932, but during the war the enrollment fell to 500.

GEORGE BRYCE,
Founder of Manitoba College and a Founder of the Manitoba University.

MANITOBA SCHOOL QUESTION. In 1871, shortly after the colony of Assiniboia had become a province of Canada under the name of Manitoba, a law was passed establishing a dual system of denominational public schools, serving respectively the needs of the French

(Roman Catholic) and English-speaking (Protestant) population in the province. At this time these racial and religious components were pretty evenly divided; but immigration from Ontario speedily gave a marked preponderance in numbers to the English-speaking section, and in 1889 it was reported that of the 618 schools in the province 545 were Protestant and 73 Roman Catholic. An agitation against the system of separate schools had begun to gather volume, and in 1890 under Premier Greenway an act was passed in the provincial legislature abolishing all sectarian schools and establishing a common school system, under which all school taxes, whether derived from Protestants or Catholics, were appropriated to the support of the new public schools. The passing of this act was hotly resented by the French-speaking Catholic population as an attack on their language and religion, and as an invasion of the terms of the British North America Act and the Manitoba Act, which guaranteed minority rights in regard to education. Under the leadership of Archbishop Taché an agitation for its repeal was engaged in by his coreligionists throughout the Dominion, but the act was permitted to come into force by the federal government. A test case, however, was taken to the law courts; the judgment of the Provincial Court sustained the validity of the act, while the Supreme Court of Canada declared it to be *ultra vires*. The final court of appeal, the Judicial Committee of the Privy Council, reversed the decision of the Supreme Court and declared for the validity of the act. Appeal was then made to the Dominion government to pass a remedial act, which the Prime Minister, Sir Charles Tupper, introduced in 1896; but the measure failed to carry through the diverse sectarian elements in the House of Commons, and the government suffered defeat in the ensuing general election. A compromise was then effected under the premiership of Sir Wilfrid Laurier, the most important feature of which was embodied in clause 258 of the School Law of 1897, which provided "that where 10 of the pupils speak the French language (or any language other than English) as their native language, the teaching of such pupils shall be conducted in French (or such other language) and English upon the bilingual system." The clause, it will be observed, is somewhat loosely drawn and does not properly define what is meant by the bilingual system. No provision was then (or afterward) made for the adequate staffing of the schools with bilingual teachers. Shortly after the passing of this law a great immigration into the Canadian West began and Manitoba became a polyglot province. The result of this influx was seen in the 1911 census, when the total number of persons of foreign birth — Germans, Austrians, Poles, Jews, Russians and Scandinavians stood at 100,000. At the end of 1915 it was reported that there were 126 French schools with 7,393 enrolments; 61 German schools with 2,814 pupils, and 111 Ruthenian or Polish schools with 6,513 pupils. One-sixth of the entire school population were being educated in bilingual schools. There were five school districts in which bilingual education might have been demanded in three languages other than English and 36 districts in which the same claim might have been made for two languages other than English. Under these conditions education remained very backward in the province — a situation that was aggravated by the indifference of communities such as the Mennonites to education itself as tending to draw its members away from the simplicity of their faith and teaching. It was only after long agitation that in the session of the legislature of 1916 clause 258 of the School Law quoted above was rescinded and nothing put in its place — a law which left Manitoba, like Prince Edward Island, New Brunswick and British Columbia, without any provision as to language in its schools. Education was at the same time made compulsory on all children between 7 and 14 years.

MANITOU, măn'ĭ-too, a name given, among the American Indian tribes, to any spirit or supernatural being, good or evil; also applied to any object of religious awe and reverence. "The Illinois," wrote the Jesuit Marest, "adore a sort of genius, which they call manitou; to them it is the master of life, the spirit that rules all things. A bird, a buffalo, a bear, a feather, a skin — that is their manitou." "If the Indian word manitou," says Palfrey, "appeared to denote something above or beside the common aspects and agencies of nature, it might be natural, but it would be rash and misleading to confound its import with the Christian, Mohammedan, Jewish, Egyptian or Greek conception of Deity, or with any compound of a selection from some or all of those ideas." The word was applied to any object used as a fetish or an amulet. It was common among all Western and Mississippi tribes.

MANITOU SPRINGS, Colo., a noted scenic, health and pleasure resort of the Rockies, picturesquely situated at the confluence of Engleman's Cañon, Ute Pass and William's Cañon, at the foot of Pike's Peak. It is in El Paso County on the Rio Grande and Colorado Midland railways, at an altitude of 6,336 feet, and is famous for its health-giving, highly radio-active mineral springs, wells, geysers and gushers, of soda and iron, 24 in number, saturated with carbonic acid gas and flowing a quarter million gallons daily. The unique Garden of the Gods with the colossal Gateway; the Seven Falls; ancient Cliff Dwellings; Pike's Peak Cog Road, highest, passenger all-steel cog railroad in the world; the Pike's Peak auto highway, to the summit of Pike's Peak — elevation, 14,109; the wonderful Cave of the Winds; Crystal Park auto highway with its succession of inspiring views at varying elevations; the Mount Manitou scenic incline, the highest, steepest cable line known, are among the many notable attractions in the neighborhood. As a health resort Manitou is open the year round, the climate and waters having a wonderfully stimulating effect on blood formation and nutrition. All modern facilities abound. Resident population, 1,357. During the height of the season, July and August, Manitou is thronged with visitors averaging from 10,000 to 15,000.

MANITOULIN (măn-ĭ-too'lĭn) **ISLANDS,** Canada, a group of islands in the northern part of Lake Huron, partially separating the waters of the lake from Georgian Bay, and east of the famous "Soo" Canal. The name is a corruption of the Indian word Manitowin, which means divinity. Except Drummond Isle, about 25 miles long and 9 miles

wide, which belongs to the State of Michigan, the group is a part of the province of Ontario. The largest island of the group is Grand Manitoulin, or Sacred Isle; about 80 miles long and 30 miles at the widest. The coast is very irregular. Cockburn, or Little Manitoulin, is nearly circular, and about eight miles in diameter. All the islands are well wooded; Grand Manitoulin and Cockburn have large pine forests. The shore waters abound in fish. Fully half the inhabitants are Indians of the Algonquin race. The cool climate in summer and the striking natural features add to the attractions of the islands and make them a favorite summer resort. Pop. 2,000.

MANITOWOC, măn-ĭ-tō-wŏk', Wis., city and county-seat of Manitowoc County, on Lake Michigan, at the mouth of the Manitowoc River and on the Wisconsin Central and the Chicago and Northwestern railroads, about 77 miles north of Milwaukee. The city, picturesquely surrounded by a semi-circle of low hills, was chartered in 1870. It has a good harbor and regular steamer connection with all of the important lake ports; large grain elevators, shipbuilding and repair yards, and an extensive export trade in wheat and other grain, lumber, leather, beer, dairy products, etc., and imports of groceries, cloth and clothing. The manufactures are important, the census of 1909 returning 80 establishments, with $6,764,000 capital stock, employing 1,824 persons at $1,007,000 annual wages, using materials valued at $3,963,000 and with a product valued annually at $5,939,000. These figures are now estimated to be about 15 per cent higher. There are three large breweries; the other industries were brick-yards, hay presses, creameries and cheese-factories, saw- and planing-mills, and manufactories of leather, flour, furniture, foundry products, machinery, agricultural implements, edge tools, cigars, canned goods and glue. The city has national, savings and other banks, waterworks, gas and electric light; and daily and weekly newspapers, several of which are published in the German language. Manitowoc is the seat of the county asylum, Saint Mary's Hospital, Saint Felix Industrial and Reform School, Holy Family Hospital and the James Library, and has a courthouse, a high school, public and parochial schools and several handsome churches. Pop. 14,000.

MANIZALES, mä-nē-sä'läs, Colombia, town, south of Antioquia and capital of Caldas, about 95 miles northwest of Bogota. The altitude is about 7,000 feet. It was founded in 1848 and its situation at the junction of main passes over the Corderilla Central range of mountains and near valuable gold mines has contributed to its rapid growth. In the valleys, in the vicinity, stock-raising is an important industry. It has fine churches and schools, a good library and a number of comfortable homes. During the civil war of 1877–78 the town was the headquarters of the rebels. The climate is not severe, although in a high altitude, as higher mountains in the vicinity are a protection. Pop. about 35,000.

MANKATO, man-kā'tō, Minn., city, county-seat of Blue Earth County, on the Minnesota River at the mouth of the Blue Earth River and on the Chicago, Milwaukee and Saint Paul, the Chicago Great Western, the Chicago and Northwestern and the Chicago, Saint Paul, Minneapolis and Omaha railroads, about 85 miles southwest of Saint Paul. It is situated in an agricultural region and in the vicinity are valuable stone quarries. Minneopa State Park is located four miles from the city. Nine miles south is the Rapidan dam, furnishing hydro-electric power for numerous southern Minnesota cities and villages. Its chief manufactures are stone, knit goods, lime, cement, beer, butter, candy, flour, brick, concrete culverts, tile and building blocks, traction engines, trip hammers, shirts and overalls, interior hardwood fixtures, cigars, incubators, brooms, paper boxes, foundry and machine-shop products. There are in manufacturing business about 2,000 employees. The principal buildings are State Normal School, Catholic and Lutheran colleges, a government building, a Carnegie public library, Saint Joseph's and Immanuel hospitals. The city has 20 churches, good public and parish schools, a commercial college and the schools mentioned. There are six banks with a combined capital of $450,000. The deposits amount to over $6,000,000. The manufactures of the city are about $4,500,000 annually.

The city was first settled in 1852 by Eastern people. It was incorporated 15 July 1858, and chartered as a city 6 March 1868. The present government is by commission, Mankato being the first Minnesota city to adopt this form Mankato was the scene of the hanging, 26 Dec 1862, of 38 Sioux Indians, having been convicted of murdering white settlers during the massacre of the preceding summer, west of the city. Pop. 10,365.

MANLEY, măn'lĭ, **John,** American naval commander: b. 1734; d. Boston, 1793. At the outbreak of the Revolutionary War he had command of the armed schooner *Lee,* with which he cruised along the coast of Massachusetts Bay, making captures of great value to the American army then investing Boston. In July 1778 his ship, the *Hancock,* was captured by a British frigate and after a rigorous confinement in Halifax, he was exchanged and in 1782 was put in command of the *Hague* frigate, which, after lying in a perilous position on a sand bank off Guadeloupe for three days, exposed to the fire of four British ships of the line, contrived to effect her escape. This exploit closed the regular maritime operations of the United States during the Revolutionary War.

MANLEY, Joseph Homan, American journalist and politician: b. Bangor, Me., 13 Oct. 1842; d. Augusta, Me., 7 Feb. 1905. He was graduated from the Little Blue Abbott Academy at Farmington, Me., in 1858 and in 1862 from the Albany Law School. He was admitted to the bar in 1865. In 1866 he was president of the city council of Augusta and in 1881 was appointed postmaster of Augusta by President Garfield, which office he held for seven years. Acquiring a half interest in the *Maine Farmer* he joined hands with James G. Blaine in aggressive local and national politics, dictating the editorial policy of that paper for three years. He was a delegate to the Republican National conventions of 1880 and 1888, was for many years chairman of the Maine Republican State Committee and a member of the Republican National Committee, and was a notable figure in

the executive committees of 1896 and 1900, which aided in the election of McKinley.

MANLEY, Mary de la Rivière, English author: b. in the Island of Guernsey about 1663; d. London, 11 July 1724. She succeeded Swift as editor of the *Examiner* in 1711. She is known for her 'Secret Memoirs and Manners of Several Persons of Quality of Both Sexes: from the New Atlantis' (1709), a licentious satire reflecting on politicians of the day, that caused the arrest of both the author and the publisher, though they were subsequently discharged. This work was continued in the 'Memoirs of Europe' (1710). She also published 'Letters Written by Mrs. Manley' (1696); 'The Secret History of Queen Zarah and the Zarazians' (1705); 'The Adventures of Revella' (1714); 'The Power of Love: in Seven Novels' (1720), and other unimportant books.

MANLIUS, măn'lĭ-ŭs, **Marcus,** Roman legendary hero, of the 4th century B.C., called Capitolinus because of his successful defense of the Capitoline Hill. Tradition says he was aroused to action by the cackling of Juno's sacred geese just in time to prevent the surprise of the citadel by the Gauls (390 B.C.). Two years before he defeated the Æqui; and in six years after (384 B.C.) was thrown from the Tarpeian rock, having been declared guilty of plotting to become king or dictator. This judgment, almost certainly unjust, was due to the envy of the patricians, who distrusted Manlius' philanthropic endeavors to free plebeians sold for debt.

MANLY, Basil, American clergyman and educator: b Pittsborough., Chatham County, N. C., 28 Jan. 1798; d. Charleston, S. C., 25 Jan. 1865. He was graduated at South Carolina College in 1821, and, after filling several charges, in 1837 he became president of the University of Alabama, remaining there nearly 20 years.

MANLY, John Matthews, American educator and author: b. Sumter County, Ala., 2 Sept. 1865. He was graduated at Furman University in 1883 and at Harvard in 1889. He obtained the degree of D.Ph. at Harvard in 1890 and from 1891 to 1898 was associate professor and professor of English at Brown University and since 1898 has been professor and head of the department of English at the University of Chicago. In 1909 he was Chicago exchange professor at the University of Göttingen. He is a member of the Modern Language Association. He contributed to the 'Cambridge History of English Literature' and to the 'Encyclopædia Britannica' and to various periodicals. He edited 'Macbeth' (1896); 'Specimens of the Pre-Shakespearean Drama' (1897); 'English Poetry' (1907); 'English Prose' (1909); 'Lessons in English,' with E. R. Bailey (1912); 'A Manual for Writers,' with J. A. Powell (1914); 'English Prose and Poetry' (1916). He is also managing editor of *Modern Philology*.

MANN, Sir **Donald D.,** Canadian contractor and financier: b. Acton, Ontario, 23 March 1853. In the later 70's he went West, became manager for a firm of contractors who had a sub-contract on the Canadian Pacific line and thereafter worked continuously as a contractor until the completion of the main railway. Between 1881 and 1883 he completed various contracts for railroads and in the two following years began railroad-building in the mountains. He also undertook contracts for construction and tunnels in Columbia Cañon and in the Selkirk Range of the Rocky Mountains. Together with Sir William Mackenzie (q.v.) he constructed the Canadian Northern Railway (q.v.). In 1887 and a part of 1888 they constructed the Canadian Pacific short line through Maine. In December 1888 Mr. Mann visited Panama, Ecuador, Peru and Chile with a view of building railways for the Chilean government, but was not satisfied with the prospects there and declined the contract offered. Later he visited China. He was associated with the building of the Qu'Apelle, Long Lake and Saskatchewan Railway, and was one of the original syndicate which built the Winnipeg Electric Street Railway. He is also interested in many other enterprises. He was knighted in 1911.

MANN, Heinrich, German novelist, brother of Thomas Mann (q.v.): b. Lübeck, 27 March 1871. He attended the Katharineum School in his native city and then entered business. In 1893 he moved to Munich, later changing his abode to Berlin, with frequent sojourns in Italy, particularly Florence. His permanent home he finally fixed at Munich. Like his brother Thomas, Heinrich is a reserved, unsociable character, who has developed a feeling almost of hostility for the types of German life with which he is surrounded. His mother was partly of creole origin, and this circumstance is taken by some German critics (e.g., Kurt Martens in his essay in 'Literatur in Deutschland,' 1910) as explaining Heinrich's predilection for the life and literature of the Romance countries as opposed to those of the Germanic countries. His first works were volumes of short stories: 'Das Wunderbare' (1897); 'Ein Verbrechen und andere Geschichten' (1898). Next came novels: 'In einer Familie' (1898); 'Im Schlaraffenland' (1901); 'Die Göttinnen, oder die drei Romane der Herzogin von Assy' (3 vols., 1902–03); 'Die Jagd nach Liebe' (1904). 'Die Göttinnen' represents an ideal of womanhood in three different phases (Diana, Minerva, Venus) and is a brilliantly constructed hymn of joy in the Romance style. Again he turns to the short story: 'Flöten und Dolche' (1905); 'Professor Unrat' (1905); 'Eine Freundschaft' (1906). 'Zwischen den Rassen' ('Between the Races,' 1908) is a novel dealing with the affection of a young girl, Lola Gabriel, for a German and an Italian, who are supposed to incorporate the virtues of their respective races. It has met with great popularity, but the attempt to capitalize racial characteristics in this way is too great a task for all but the greatest men. Heinrich Mann has also tried his hand at the drama, in 'Die Schauspielerin (1911), but with no particular success.

JACOB WITTMER HARTMANN.

MANN, Horace, American educationist: b. Franklin, Mass., 4 May 1796; d. Yellow Springs, Ohio, 2 Aug. 1859. He was graduated from Brown University in 1819, studied law at the Litchfield (Conn.) Law School and in offices at Dedham, Mass., in 1823 was admitted to the bar, and practised at Dedham from 1827 to 1833, when he removed to Boston. In 1827–33 he was a representative in the State legislature, in 1833–37 State senator and in 1836–37 presi-

dent of the senate. From the first he identified himself with philanthropic interests. His first speech in the assembly was on religious liberty; and one of his enterprises was the establishment of the State lunatic hospital at Worcester (1833), in connection with which he was chairman of the board of commissioners and later of the board of trustees. In 1837, upon the appointment by the State of a board of education to revise and reorganize the Massachusetts common-school system, Mann became secetary to the board (19 June). He withdrew from politics and from a lucrative practice at the bar, and devoted himself entirely to a work which proved of the greatest significance not for Massachusetts only but for the entire United States. This work he accomplished largely in spite of opposition often pronounced. For the reform of State education he founded and edited the monthly *Common-School Journal*, held teachers' conventions, published 12 most valuable annual reports and established normal schools. In 1843 at his own expense he visited Europe for the study of Continental methods. He was successful in arousing throughout the country an unprecedented interest in educational affairs. In 1848 he was elected to Congress to succeed John Quincy Adams, deceased; and he served until March 1853. He was strongly opposed to slavery, and fearlessly attacked Webster's course. On 15 Sept. 1852, he declined the nomination for the governorship of Massachusetts, and on the same day accepted the presidency of Antioch College, Yellow Springs, Ohio, in which post he served until his death, greatly influencing the educational development of Ohio. He was a Fellow of the American Academy of Arts and Sciences. In addition to his annual reports he published 'Reply to 31 Boston Schoolmasters' (1844); 'Report of Educational Tour' (1846); 'A Few Thoughts for a Young Man' (1850); 'Slavery: Letters and Speeches' (1852); 'Lectures on Intemperance' (1852); 'Powers and Duties of Woman' (1853); and 'Sermons' (1861). Consult the 'Life' by Mary P. Mann (1865); and Boone, 'Education in the United States' (1890); 'Report' (United States Commission of Education, 1895–96); Hubbell, G. A., 'Life of Horace Mann' (1910).

MANN, James Robert, American congressman: b. near Bloomington, Ill., 20 Oct. 1856. He was graduated at the University of Illinois in 1876 and at the Union College of Law, Chicago, in 1881. He was admitted to the bar in 1881 and thereafter practised law at Chicago. He was attorney for the village of Hyde Park in 1888 and upon its annexation to Chicago he became alderman of the 32d ward, serving in 1893–96. He was temporary chairman of the Republican State Convention in 1894. He was master in chancery of the Superior Court in Cook County in 1892–96, and general attorney of the South Park Board, Chicago, in 1895. He was elected to Congress in 1896 and has served continuously since. He was leader of the Republican minority in the House during the years 1913–19 of the Wilson Administration.

MANN, Matthew Derbyshire, American gynecologist: b. Utica, N. Y., 12 July 1845. He was graduated at Yale in 1867, from the College of Physicians and Surgeons, Columbia, in 1871, and later studied in Europe. He practised medicine in New York in 1873–79; was established as a specialist in obstetrics at Hartford, Conn., in 1879–82; and in 1880–82 he was clinical lecturer on gynecology at Yale. He was professor of obstetrics and gynecology at the University of Buffalo in 1882–1910, and is now consulting gynecologist and obstetrician at the Buffalo General Hospital. He was president of the American Gynecological Society in 1894. He edited 'American System of Gynecology' (1888). Author of 'Manual of Prescription Writing' (1879).

MANN, Thomas, German writer of novels and short stories: b. Lübeck, 6 June 1875, of a wealthy family of merchants, whose traditions of solidity and solvency surrounded him in his youth and gave him the material for his treatment of the family life of the Hanseatic patricians in 'Buddenbrooks' and other works. After his father's death (1893) the family settled in Munich, where Mann joined them later (1894), and where he became an apprentice in the offices of the South German Fire Assurance Bank, a position of which he soon wearied. He attended lectures on æsthetics and literature at the University of Munich, later lived at Rome, returning to Munich in order to join (1899) the staff of *Simplicissimus* (q.v.), to which he remained attached for a number of years. Mann has a delicacy and refinement of style and observation that are unparalleled in German literature. In his only long novel 'Buddenbrooks' (1901), which established his literary reputation, as well as in his short stories, he captivates by a psychologic naturalism which is enhanced by the fact that the feelings depicted are those of well-to-do middle class persons in comfortable, if not luxuriant, surroundings. Henry James, whose attention is usually devoted to a higher social class, is the English novelist whom Mann's delicate and insinuating treatment most resembles, and the two men are also similar in their scrupulous precision and artistry of language. 'Der Tod in Venedig' ('A Death in Venice,' 1913), which has the proportions of a German *novelle* (about 100 pages), describes the last hours of an elderly German writer, who, during a sojourn in Venice at a time when that city is visited by a plague, discovers abysses of his sexual life which he has hitherto not suspected, and is carried off by the plague before he is fully ready to accept the implications of his new-found knowledge. Mann's other works include short stories: 'Der kleine Herr Friedemann' (1898); 'Tristan' (six short stories, 1903); 'Fiorenza' (drama, 1906); 'Bilse und ich' (1906); 'Königliche Hoheit' (novel, 1909).

JACOB WITTMER HARTMANN.

MANN, Tom, English Socialist: b. Foleshill, Warwickshire, 15 April 1856. His boyhood was spent in farming and mining and from the age of 14 he served an apprenticeship of seven years at engineering in Birmingham; in 1877 he went to London, where he was prominent in connection with various trade-union affairs, and in 1885 he became a Socialist. Among his works are 'A Socialist's View of Religion' (1896); 'The Position of the Dockers and Sailors' (1897); 'The International Socialistic Movement,' etc.

MANN, William Julius, American Lutheran clergyman, educator and author: b.

Stuttgart, Germany, 29 May 1819; d. Boston, Mass., 20 June 1892. He was educated at Stuttgart and Tubingen and was ordained in the Lutheran ministry in 1841. He came to the United States in 1845 with Dr. Philip Schaff. He was assistant pastor at Saint Michael's and Zion's congregation, Philadelphia, in 1850–63, pastor in 1863–84 and thereafter pastor emeritus. He was professor of Hebrew ethics and symbolics at the Lutheran Theological Seminary at Philadelphia from the time of its establishment. Author of 'Plea for the Augsberg Confession' (1856); 'The Lutheran Church and its Confessions' (1880); 'Life and Times of Henry Melchoir Mühlenberg' (1887), etc.

MANNA, a name for several substances, especially a saccharine matter which exudes naturally or from incisions made in the trunk and branches of a species of ash (*Fraxinus ornus*). It first appears as a whitish juice, thickens on being exposed to the air and when dried forms a whitish or reddish granular substance, which is the manna of commerce. The tree is a native of Italy and is cultivated extensively in Sicily. June and July are the two months in which the manna is collected. It is detached from the trees with wooden knives and is afterward exposed to the sun for drying. A little rain, or even a thick fog, will often occasion the loss of the collections of a whole day. The taste is sweet and slightly nauseous. It is a mild purgative and is principally administered to children. The finest kind of manna is called *flake manna;* it is white or yellowish-white in color, light, porous and friable. *Sicilian manna* is generally found in small, soft, round fragments; its color is yellowish-brown and it is generally mixed with more or less impurities. The principal constituent is mannite, chemically separable as a white crystalline substance of a sweetish taste, which also appears as a whitish efflorescence on certain edible seaweeds and fungi. To this and the saccharine elements, the nutritiousness of manna is due.

Many other sweet tree-juices go by the name of manna, or false manna, since they contain no mannite, but depend for their peculiar qualities upon the possession of melitose or meletzitose. In many cases the exudation of the sap is due to the irritation produced by insects or is the product of the insects themselves. Thus edible exudations are obtained from the Oriental teatree, sandal-wood and an Australian grass (*Andropogon*); in Europe from the larch and an oak, and in Persia from the camel's-thorn. American manna is derived in California from the sugar pine and from a rush (*Phragmites*); while in India a species of bamboo secretes it so copiously as to form an important food-resource for the people in periods of famine.

The tamarisk manna, derived from the tamarisk trees about the eastern end of the Mediterranean, is not a direct product of the tree, but of a scale-insect, the manna-insect (*Jossyfraria mannifera*), which abounds upon the tamarisk and secretes the substance, which some persons have regarded as the manna of the Bible. In Australia the waxen larval cases of several species of flea-lice (*Psyllidæ*) that feed upon the gum-trees (*Eucalyptus*) are gathered and eaten by the natives under the name of "lerp."

The Scriptural manna (Heb. Man-hu, what is it?) is described in Exodus (xvi, 15) as covering the ground in such quantities as to supply food for the vast multitude of the Israelites. It was small and round like coriander seed, white and tasting like honey and wafer. It was of the color of bdellium (Num. vi, 7). According to the Biblical narrative it was the food of the Children of Israel for 40 years. They complained of the diet (Num. xi, 6). In Rabbinical literature there are a vast number of stories about the manna hard to accept except as myths. It cannot be identified with any of the substances known nowadays as manna; but is called in the Bible "bread from heaven," while the Jewish doctors taught that it became to each person who ate it that meat of whatever kind he liked best.

MANNAIA. See GUILLOTINE.

MANNHEIM, măn'hīm, Germany, a large town of Baden on the Rhine, at the confluence of the Neckar, 45 miles south of Frankfort. It lies in the administrative district of Mannheim, of 1,386 square miles area and 641,545 population. Dikes protect it from inundation and there are extensive harbors and modern docks. A bridge across the Rhine, here 1,200 feet wide, connects with Ludwigshafen, Bavaria, and there is also a bridge across the Neckar. Mannheim is the first commercial town in the grand-duchy and on the upper Rhine. This it owes to its admirable position on two important navigable rivers and its railway communications. The arrivals of freight here in 1912 were 4,664,763 tons, and the departures 729,129 tons. During the World War it was important as a distributing point for the German army. The principal articles of trade are corn, flour, wood, petroleum, coal, tobacco, cattle, sugar, iron goods, etc. The manufactures consist chiefly of iron-castings, machinery, chemicals, cigars, carpets, woolen goods, paper, tiles, celluloid and rubber wares, mirrors, carriages, trinkets, sugar, liqueurs, starch, glue, etc. Mannheim was once strongly fortified and lying not far from the French frontier and near the centre of military operations, suffered severely during the wars between France and Germany. In a siege by the Austrians in 1795 only 14 houses remained uninjured. Hence, notwithstanding the antiquity of its foundation, it has become an entirely modern town with regular, straight streets, known, as in America, by numbers, and with fine public squares. The principal buildings are the former Palatine palace, with a museum and picture gallery in one of its wings, a public library of 75,000 volumes and good gardens behind it; the Jesuits' church, an imposing edifice, with a profusely decorated interior; the former observatory building; the theatre, one of the best in Germany; several gymnasia and schools, conservatory of music, hospitals and orphanage, town-house, railway station, etc. Pop. about 97,980; in 1899 the suburb of Neckaran was incorporated with it. Pop. 150,000.

MANNING, măn'ĭng, **Daniel,** American journalist and financier: b. Albany, N. Y., 16 May 1831; d. there 24 Dec. 1887. At 10 he entered the printing office of the Albany *Atlas* which shortly after was merged in the *Argus,* upon which paper he became a reporter and in time an authority in State politics. He was as-

sociate editor in 1865 and later was part owner of the paper which in his hands was a strong political power and instrumental in breaking up the Tweed ring. He strongly supported Governor Tilden's administration and through his membership of the New York State committee he was intimately connected with the leaders of his party. Upon Cleveland's inauguration in 1885 Manning was appointed Secretary of the Treasury, the affairs of which office he conducted with great ability. He resigned in 1887 as a result of ill health, though he was connected with several commercial and banking enterprises until his death in the same year.

MANNING, Henry Edward, cardinal of the Roman Catholic Church and archbishop of Westminster: b. Totteridge, Hertfordshire, 15 July 1808; d. Westminster, 14 Jan. 1892. He was educated at Harrow and Balliol College, Oxford, became a Fellow of Merton College in 1832 and in that year he was ordained and appointed curate of Woollavington-cum-Graffham in Sussex. In 1833 he became rector of Woollavington and was appointed archdeacon of Chichester in 1840. In 1842 he was select preacher to the University of Oxford. He took very little part in the tractarian movement and did not write any of the tracts, but he formed friendships with some of the leaders of the movement. In 1851, after the decision in the "Gorham case," he joined the Roman Catholic Church and was ordained priest. He founded the Congregation of the Oblates of Saint Charles at Bayswater, London, in 1857, and upon the death of Cardinal Wiseman was consecrated archbishop of Westminster in 1865. At the Œcumenical Council in 1870 he was an ardent supporter of the infallibility doctrine, and in 1875 was made a cardinal by Pius IX. Manning was a trusted leader of the Ultramontane party in his Church, and he commended himself to the world in general by his zeal on behalf of temperance, education and the betterment of the working-classes. He is the author of four volumes of sermons published before 1850; and among his other writings are 'The Temporal Mission of the Holy Ghost' (1865 and 1875); 'Petri Privilegium' (1871); 'The Vatican Decrees' (1875); 'The Catholic Church and Modern Society' (1880); 'The Eternal Priesthood' (1883); 'Characteristics' (1885); 'Miscellanies' (1877–88); 'Religio Viatoris' (1889). Consult Lives by Hutton (1892); Purcell (1896); Ward (1897); De Pressensé (1903); Fitzgerald, 'Fifty Years of Catholic Life and Progress' (1901). Consult his Memorials (1892).

MANNING, James, American Baptist educator, first president of Brown University: b. Elizabeth, N. J., 22 Oct. 1738; d. Providence, R. I., 29 July 1791. He was graduated at Princeton College in 1762, in 1763 became pastor of a Baptist church at Morristown, N. J., and about a year later pastor of a church in Warren, R. I. There he almost immediately commenced a Latin school, which seems to have been in some sense the germ of Rhode Island College. He had previously proposed to several influential men in his denomination, assembled at Newport, the organization of "a seminary of polite literature, subject to the government of the Baptists" and had drawn up a plan for such an institution. In 1764 the legislature granted them a charter, and in 1765 he was appointed "president and professor of languages and other branches of learning, with full power to act in these capacities, at Warren or elsewhere." The college went into operation at Warren in 1766, and the first commencement was held there in 1769, when a class of seven was graduated. In 1770 it was determined to remove the college to Providence, and during the Revolution, when the college edifice was occupied as a military barrack, and afterward as a hospital, he was actively engaged in clerical duties and also rendered important services to the patriotic cause. In 1783 he resumed his duties at the college, and in 1786 represented Rhode Island in Congress, where he exerted himself to secure the adoption of the national Constitution. From 1770 till the year of his death he was also pastor of the first Baptist church in Providence. He resigned the presidency of the college in 1790. Consult Guild, 'Life and Times of James Manning and the Early History of Brown University' (1894). See BROWN UNIVERSITY.

MANNING, Robert, American pomologist: b. Salem, Mass., 19 July 1784; d. there, 10 Oct. 1842. He established a pomological garden at Salem in 1823 with the purpose of establishing the identity and classifying the various varieties of fruit. His efforts accomplished a great public benefit in introducing to general use the best varieties of fruit and in standardizing the nomenclature. At the time of his death his fruit garden contained more than 1,000 varieties of pears and many hundreds of apples, peaches, plums and cherries. He was an uncle of Nathaniel Hawthorne. Largely through his efforts the Massachusetts Horticultural Society was established and he was a generous contributor to its support. Author of 'Book of Fruits' (1838).

MANNING, Thomas Courtland, American jurist: b. Edenton, N. C., 1831; d. New York city, 11 Oct. 1887. He was graduated from the University of North Carolina, admitted to the bar and for a time practised law in his native place, but in 1855 he went to Alexandria, La., and there established himself in a large practice. He was a delegate to the Secession Convention and at the outbreak of the war entered the Confederate army as lieutenant. He served as adjutant-general in 1863 and attained the rank of brigadier-general. In 1864 he was associate judge of the Supreme Court of Louisiana. He was a presidential elector in 1872 and 1876, and in 1877 he was chief justice of the State Supreme Court. He was denied admission to the Senate upon his appointment to that body in 1880, and in 1882–86 he again filled the office of justice of the Supreme Court. He was appointed Minister to Mexico in 1886 and died in office.

MANNING, William Thomas, American Protestant Episcopal clergyman: b. 1866. He was graduated at the University of the South in 1893. He was ordained deacon in 1889 and priest in 1891; and in 1892 he was rector at Redlands, Cal. He was professor of dogmatic theology at the University of the South in 1893–95; and was rector at Landsdowne, Pa., in 1896–98, and at Nashville, Tenn., in 1898–1903. He became vicar of Saint Agnes' Chapel, New York, 1903; was appointed assistant rec-

tor of Trinity Parish, New York, in 1904, and in 1908 became rector there.

MANNING, S. C., town, county-seat of Clarendon County, on the Atlantic Coast Line Railroad, about 50 miles southeast of Columbia and 70 miles north of Charleston. It is situated in an agricultural region and in the vicinity are large pine forests. Some of the manufactures are flour, lumber and knit goods. Pop. about 2,000.

MANNING, or MANNYNG, Robert, English poet: b. 1264; d. 1340?. See BRUNNE, ROBERT OF.

MANNINGTON, W. Va., village in Marion County, 45 miles southeast of Wheeling, on the Baltimore and Ohio Railroad. It is situated in a rich coal-mining district and has extensive oil and gas interests. There are manufactures of pottery, glassware, tools and machinery and flour. There is a municipal water-supply system. Pop. 2,672.

MANNITE, or MANNITOL, a singular chemical compound which has the formula $C_6H_8(OH)_6$ and constitutes from 30 to 60 per cent of the weight of the dried juice which exudes from the manna ash (*Fraxinus ornus*), a tree growing in the Mediterranean regions. It occurs also in many other plants and is formed in the lactic fermentation of sugar, and also in the spontaneous fermentation of the juice of the sugar-cane, in tropical countries. It may be prepared by boiling manna with dilute alcohol, the mannite crystallizing out upon cooling. The crystals are then purified by recrystallization from water. It is a white compound, crystallizing in needles or four-sided prisms, and is readily soluble in water, insoluble in ether and but slightly soluble in alcohol. It melts at 329° F. and begins to sublime at about 400° F. Mannite has a pleasant, sweet taste and in some respects it resembles the sugars. It is not a sugar, however, but a hexatomic alcohol. (See ALCOHOL). Chemically, it is derived from the hydrocarbon hexane, C_6H_{14}, by the replacement of six atoms of hydrogen by six molecules of hydroxyl (OH). Sorbite (or sorbitol) and dulcite (or dulcitol) have the same chemical formula as mannite and resemble it very closely. They are, in fact, isomers of mannite. Sorbite is prepared from mountain ashberries, and dulcite from Madagascar manna. See MANNA.

MANNLICHER, män'lĭh-ĕr, **Ferdinand,** RITTER VON, Austrian engineer and inventor: b. Mainz, 30 Jan. 1848; d. 1904. He was chief engineer of the Northern Railroad for many years, and after the success of the needle-gun at Sadowa in 1866 began experiments which ultimately produced a magazine rifle which was adopted by the Austrian army in 1885. He has become famous for his numerous inventions in small arms and was elected to the Upper House of Austria in 1899 in recognition of his distinguished services.

MANNY, Walter Baron de, English soldier and philanthropist: d. 1372. His memory is perpetuated as the founder of Charterhouse School (q.v.), and by his military exploits as recorded by his friend Froissart in his 'Chronicles.' Scion of a noble family of Hainaut, he arrived in England in 1327 in the train of Queen Philippa, rose to high rank in the Scottish wars of Edward III, became a commander of the English fleet, and of the army in France, and both in military commands and in diplomatic negotiations received the commendation of the king. He was created a baron and knight of the garter and in 1335 married the Countess, later the Duchess of Norfolk. Consult 'Froissart's Chronicles' (Globe ed., Eng. trans., London 1895).

MANOBAS, mä-nō'bäs, a native tribe of the Philippines, living chiefly in the valley of the Rio Agusan, island of Mindanao, and at some places in the district of Dávao, Mindanao. They are of Malay race, head-hunters and largely heathen, though the work of the Jesuits among them has resulted in a considerable portion becoming Roman Catholics. The name in earlier times was often applied to other heathen tribes of Mindanao.

MANŒUVRES, mą-noo'vĕrz. See ARMY AND NAVY MANŒUVERS.

MANOMETER (Greek, "rarefaction measurer"), an instrument for measuring the pressure exerted by gas or liquid. It may have many forms, of which the mercurial barometer is one. (See BAROMETER). One of the commonest designs, for the measurement of pressures not greatly different from that of the atmosphere, consists of a U-tube, one of whose legs is open to the air, while the other is in communication with the gas or liquid whose pressure is to be measured. The lower part of the U is filled with some non-volatile liquid of known density, and the difference between the pressure of the fluid under examination and that of the atmosphere is found by observing the difference between the levels of the manometric fluid in the two branches of the U-tube. If the absolute pressure of the fluid is desired, it is necessary to add the atmospheric pressure to the differential pressure as read from the manometer. In rough work it may be sufficient to assume the atmospheric pressure to be 14.7 pounds per square inch; but in more refined observations the atmospheric pressure must be determined by reading the barometer, simultaneously with the manometer. Mercury is commonly the liquid that is used in the U-tube, but when the differences in pressure that are to be read are very small, some less dense liquid may be used with advantage. Sulphuric acid is often employed in such cases; and where (as in the measurement of chimney draft) a slight amount of evaporation from the manometric fluid is unimportant, water may be employed. When the pressure to be measured materially exceeds one atmosphere, the siphon manometer, as just described, is modified by sealing one of the ends of the U-tube, instead of leaving it open to the air. In this case the pressure is determined by observing the amount of compression that it produces in the air that is confined in the sealed arm of the siphon, by the manometric fluid; for it is known, by Boyle's law, that the volume of the air in this arm is sensibly proportional to the reciprocal of the absolute pressure, so long as the temperature remains constant. Boyle's law is not rigorously exact, however, and when a high degree of precision is required from the compression manometer, it is necessary to make allowances for its error. Data for this purpose have been given by Amagat, up to 85 atmospheres, when the temperature of the manometer is maintained at 16° C. (60.8° F.). Consult

Amagat, 'Comptes Rendus,' Vol. XCIX, p. 1153; Preston, 'Theory of Heat,' p. 403). In steam engineering the commonest form of manometer is the "Bourdon gauge," which depends for its action upon the elastic deformation of a flattened metallic tube when exposed to an internal pressure. In practice the flattened tube is bent into a circular form, one end of it being fixed while the other communicates, by means of a multiplying gear, with an index hand which travels over the face of a graduated dial. A tube so constructed straightens out slightly when subjected to an internal pressure, returning again to its original form when the pressure is removed. The deformation is approximately proportional to the magnitude of the pressure (so long as the tube is not strained beyond its elastic limit), and hence the dial may be graduated, without difficulty, so as to indicate true pressures, at least to a degree of precision quite sufficient for the purposes of steam engineering. All such gauges should be carefully compared with a standard mercury column, however, before great reliance is placed upon them; for it is found that they are sometimes seriously in error in some parts of the scale, even when sensibly correct in other parts. In using them in connection with steam boilers, care should also be taken to prevent steam or highly heated water from coming into direct contact with the curved tube, since the elastic properties of the tube are injured by overheating. To ensure the proper protection of the gauge, a siphon, or a complete circular bend, should be placed in the pipe between the gauge and the boiler. The trap so formed will fill with water of condensation the first time the boiler is fired up, and thereafter it will be impossible for steam to enter the gauge directly.

MANON LESCAUT, a short novel of 200 pages, the seventh volume of a larger work, "Memoirs of a Nobleman," has sufficed to assure the reputation of its author, Prévost d'Exiles (1697–1763), better known as L'Abbé Prévost. After a life of adventure in France, England, Holland and Germany when he was in turn soldier, monk, journalist, teacher and later chaplain of the Prince of Conti, Prévost became a professional writer and composed more than 100 volumes. He also translated many English works, and among those, his adaptations rather than translations of 'Pantela,' 'Clarissa Harlowe' and 'Grandison' gave to Richardson a great popularity in France during the second half of the 18th century, to the detriment of Prévost's own works. Of all Prévost's novels, critical articles in the periodical *Pro and Con* and pseudo-scientific travel stories, Manon Lescaut alone survives. Published in Holland in 1731, it "took like wild fire" according to contemporary testimony and more than 30 editions were printed before the end of the century, that of 1753 revised and corrected by the author being considered as the best. This novel is the story of the passionate love of the young Chevalier des Grieux for the courtesan Manon. It is told in a simple narrative style and with a sincerity which leads us to believe that Prévost relates at least in part some episodes of his stormy life. The novel presents a realistic and painful picture of the sufferings which uncontrolled passion brings upon those who lack the will power to resist it, and while Prévost does not attempt to excuse or justify the faults of his heroes, he shows passion as a terrible force whose victims are to be pitied rather than blamed. Prévost had many imitators even in his own time, and the theme of Manon, dealing with rehabilitation through love and sufferings, is found later in 'Marion Delorme' (Hugo), 'La Dame aux Camélias' (Dumas), 'Sapho' (Daudet) and in the works of several Russian novelists.

LOUIS A. LOISEAUX.

MANOR (old French *manoir, maneir,* from L. *manere,* to remain, being the residence of the owner), a piece of territory held by a lord or great personage, who occupied a part of it, as much as was necessary for the use of his own household, and granted or leased the remainder to tenants for stipulated rents or services. No manors, with all their incidents and franchises, have been granted in England since the reign of Edward III. One of the most important incidents to these ancient manors was the right to hold a court, called a *court-baron,* which was held within the manor, and had jurisdiction of misdemeanors and nuisances within the manor, and disputes about property between the tenants. The manor system was in vogue in the United States only during the British occupation, but many old manor names like Briarcliffe manor, Pelham manor, etc., are still retained by the present owners of large estates. See also TENURE.

MANOURY, General. See MAUNOURY.

MANRIQUE, mạn-rē-kā, **Angel,** Spanish poet and ecclesiastic: b. Burgos, 1577; d. Badajos, 1649. He rose to high rank in monastic life, becoming finally head of the Cistercienses throughout Spain, and finally bishop of Burgos (1645). He wrote a history of the Cister order which had considerable reputation throughout Europe. He also wrote many devotional and other works of a religious or religio-historical nature.

MANRIQUE, Gómez, Spanish poet and dramatist: b. about 1415; d. 1491. He was son of Pedro Lord of Amusco, and a younger brother of Rodrigo Manrique, master of Santiago and one of the troubadours of the court of John II. He became a soldier of some note and took part in wars against the Moors. He sided with the Infante, Don Enrique, against Alvaro de Luna and the royal court. He was very active and seems to have taken part in almost every political disturbance and warlike expedition of Spain in his day. He was very much mixed up in the political move which forced the marriage of Ferdinand of Aragon and Isabel of Castile, which was of great significance since it ultimately led to the expulsion of the Moors from the country and the political and national unity of all Spain. He attained to numerous high offices under the king of Aragon and later under the united crowns of Castile and Aragon, becoming finally a member of the royal council and the confidant of the joint sovereigns. Gómez Manrique, notwithstanding his tempestuous and warlike life, was one of the greatest orators of his age and a talented poet. He was one of the set of writers who sang the glories of the Virgin Mary and their love for and devotion to her. He was a satirist with a keen sense of humor, and he attempted nearly every class of literature known in his day in Spain.

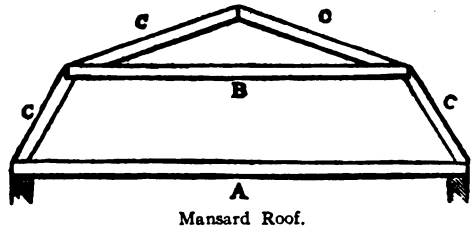
He played his part in helping to introduce into Spanish poetry the poetical forms of Italian literature. He also wrote religious dramas in the form in which they appeared in his age. For this reason and for the fact that he introduced more than customary life into these dramatic pieces, his work had considerable influence on the development of the drama, both religious and, subsequently, profane, in Spain. The best of his religious dramas, all of which are of a liturgical caste, is 'Representacion del nacinùento de Nuestro Señor.' He also wrote on political and philosophical subjects and on matters of ethics and vices such as gluttony, envy, laziness, and of virtues, such as reason (in human actions), faith, prudence and honesty of purpose in government. His poem on the death of the Marques de Santillana became immensely popular and Gómez Manrique rose to be the most quoted writer and most recited lyrical poet of his day. His 'Cancionero' has been published several times and poems of Gómez Manrique have appeared in various other cancioneros. Consult Menéndez y Pelayo, Marcelino, 'Antologia de poetas liricos castellanos' (Vol. VI, Madrid 1886); Pas y Melia, A., 'Cancionero de Gómez Manrique' (Madrid 1885); Rios, Amador de los, 'Historia critica de la leteratura española.'

MANRIQUE, Jorge, Spanish poet: b. about 1440; d. 1479. He was son of Rodrigo Manrique, grand master of Santiago. He early took a prominent part in the troubles of the reign of Henry IV, taking sides with Don Alfonso. Notwithstanding the fact that most his life was passed in active military duty and that he died in battle in the attack on the fortress of Garci-Muñoz, he yet attained such an eminence as a poet that he is still classed among the great writers of Spain, and a worthy nephew of Gómez Manrique (q.v.) and heir of his father, Rodrigo Manrique, who was one of the successful troubadours at the court of John II, one of the foremost patrons of lyrical poetry. Jorge Manrique has written satires, love songs and poems of a like nature common to the age in which he lived; but his most noted poem and the one to which he owes his lasting fame is 'Coplas de Jorge Manrique por la muerte de su padri.' This is one of the finest lyrics in the Spanish language, instinct with true poetic form and thought and sympathy. This poem has been imitated and praised by some of the greatest writers of Spain and it has found universal favor in the eyes of the critics. Longfellow has made a worthy translation of it into English; and it was set to music as far back as the 16th century by Venegas de Henestrosa. (See COPLAS DE MANRIQUE; ROMANCERO DEL CID). Consult Longfellow's translation and Fitzmaurice-Kelly, James, 'A History of Spanish Literature' (New York 1898); Menéndez y Pelayo, Marcelino, 'Antologia de poetas liricos castellanos' (Vol. VI, Madrid 1896); *Biblioteca de autores españoles* (Rivadeneira, Vols. XXXII and XXXV) contains his works and notices thereof.

MANS, mäṅ, **Le,** France, the capital of the department of Sarthe, on a height above the Sarthe, here crossed by three bridges, 115 miles southwest of Paris. It consists of a lower and an upper town. The principal edifice is a fine Gothic cathedral of the 11th century. It has a seminary, excellent schools, a public library of 60,000 volumes and several museums. The chief manufactures are metal works, railway cars, tobacco, canned goods, chemicals, cordage, leather and woolen and linen goods; being a railway centre it is a distributing point for farm produce, canned goods, wines, etc. Le Mans existed in the time of the Romans under the name of Cenomani, a tribe who inhabited the district. Numerous vestiges of Roman structures (subterranean aqueducts, walls, etc.) still remain. It was long in the possession of the English, and Henry II, the first Plantagenet, was born here. During the Franco-German War (1870–71) General Chanzy was defeated here by Prince Frederick Charles and the Grand-duke of Mecklenburg. A monument commemorates the battle. Pop about 69,361.

MANSARD, mäṅ-särˊ, or **MANSART, François,** fräṅ-swäˊ, French architect: b. Paris, 23 Jan. 1598; d. there, 23 Sept. 1666. He designed many important buildings in Paris, as well as provincial chateaux and country seats. The chateaux at Bolois are partly his work, and he built the church of Val de Grâce and the Hotel Carnavalet. The mansard roof is called after him.

MANSARD ROOF, *in architecture* (so called from François Mansard, or Mansart (q.v.), a French architect to whom the invention is attributed), a roof formed of two sets of rafters, of which the upper set are more inclined to the horizon than the lower set, and



Mansard Roof.

form an obtuse angle at the ridge. The transverse beams connecting the lower ends of the under set of rafters are called as in ordinary roofs tie-beams; the corresponding beams at the union of the upper and under rafters are called collar-beams.

MANSART, Jules Hardouin, zhül ärˊ-dooˊäṅ mäṅ-särˊ, French architect: b. Paris, 16 April 1645; d. Versailles, 11 May 1708. He was a nephew of François Mansart, or Mansard (q.v.). He directed all the great building operations of Louis XIV, who heaped favor and wealth upon him. His works include the palace at Versailles; the Maison de Saint-Cyr; the Grand Trianon; the triple dome of the Invalides, and the Chateau de Clagny, the residence of Madame de Montespan. He also designed the Place Vendôme and the Place des Victoires.

MANSE, *in Scotch law,* a name given the dwelling-house of the minister of the Established Church. In popular use the term is often applied generally to the dwelling-house of any minister of a dissenting congregation. In the Established Church every first minister of a rural parish is entitled to a manse, which the heritors or landed proprietors in the parish are bound to build and uphold. When a manse has

been built or repaired by the heritors it becomes a free manse, and all ordinary repairs have to be done at the charges of the minister.

MANSEL, Henry Longueville, English logician and theologian: b. Cosgrove, Northamptonshire, 6 Oct. 1820; d. London, 31 July 1871. He was educated at Saint John's College, Oxford, and took orders in the Anglican Church in 1845. He became Wayneflete professor of philosophy at Oxford in 1859; regius professor of ecclesiastical history 1867, and dean of Saint Paul's, London, 1868. He was made a canon of Christ Church, Oxford, in 1867. Among his publications are 'The Philosophy of Kant' (1856); 'The Limits of Religious Thought,' being the Bampton lectures for 1858; 'Metaphysics or the Philosophy of Consciousness' (1860); 'The Philosophy of the Conditioned' (1866); 'Letters, Lectures and Reviews' (1873).

MANSFELD, mäns'fĕlt, **Peter Ernst I,** COUNT, Austrian general and statesman: b. 15 July 1517; d. Luxemburg, 22 May 1604. He became governor of the Low Countries after the death of the Duke of Parma.

MANSFELD, Peter Ernst II, COUNT, German Protestant military leader: b. Luxemburg, 1580; d. Racowitza, Bosnia, 29 Nov. 1626. He was a natural son of the preceding, but, disappointed in regard to the inheritance of his father's lands, joined the Protestant princes and became the bitter enemy of Austria. He gained a victory over Tilly at Wiesloch in 1622, but was defeated by Wallenstein at Dessau in 1626, and died soon after.

MANSFIELD, mänz'fēld, **Edward Deering,** American author: b. New Haven, Conn., 17 Aug. 1801; d. Morrow, Ohio, 27 Oct. 1880. He was graduated at West Point in 1819 and at Princeton in 1822 when he took up the study of law and was admitted to the bar in 1825. He went to Cincinnati and there engaged in practise until 1835 when he accepted the chair of constitutional law and history in Cincinnati College. This post he resigned to enter the field of journalism and was editor of the *Cincinnati Chronicle,* the *Atlas* and the *Railroad Record.* For many years he was a contributor to the New York newspapers under the title "Veteran Observer." Among his many books are 'Political Grammar' (1834); 'History of the Mexican War' (1848); 'American Education' (1850); 'Popular Life of U. S. Grant' (1868); 'Personal Memoirs' (1879), etc.

MANSFIELD, Joseph King Fenno, American soldier: b. New Haven, Conn., 22 Dec. 1803; d. near Sharpsburg, Md., 18 Sept. 1862. He was graduated from West Point in 1822 and was engaged in engineering service under the government until the opening of the Mexican War when he became chief engineer under General Taylor. He took an active part in the engagements at Fort Brown, Monterey and Buena Vista, receiving promotion to the rank of colonel in recognition of his services. In 1853 he was appointed inspector-general of the United States army and served in that capacity until 1861 when he was made brigadier-general and given command of the Department of Washington which he fortified; he was afterward in command at Hatteras, Camp Hamilton, Newport News, and after capturing Norfolk was placed in command at Suffolk, Va., receiving the rank of major-general. He was in command of a corps of the Army of the Potomac at Antietam and while leading his troops fell fatally wounded.

MANSFIELD, Richard, American actor: b. Heligoland, 24 May 1857; d. New London, Conn., 30 Aug. 1907. He first studied art, opening a studio in Boston for a time, but later returned to England, and entered the theatrical profession. He at first played small parts in comic opera, and first appeared in America as Dromez in 'Les Manteaux Noires' at the Standard Theatre, New York. He afterward was very successful in a wide variety of plays, and became the head of his own company. He created such parts as Beau Brummel, Baron Chevrial, Dr. Jekyll and Mr. Hyde and Monsieur Beaucaire; among his other most successful rôles were Cyrano de Bergerac, Shylock in 'The Merchant of Venice,' Henry V, Brutus in 'Julius Cæsar,' Prince Karl in 'Old Heidelberg' and Peer Gynt in Ibsen's play. His own acting, as well as the work of his company which he carefully oversaw, was of a high artistic standard, carefully worked out in details. Consult Strang, 'Famous Actors of Today in America,' and his 'Life' by William Winter.

MANSFIELD, William Murray, EARL OF, British jurist: b. Scone, Scotland, 2 March 1705; d. London, 20 March 1793. One of the youngest sons of Viscount Stormont, he was educated at Christ Church, Oxford; studied law; was called to the bar in 1730; won a large Scottish practice and many literary friends, the foremost being Alexander Pope, and in 1742 was made solicitor-general and entered Parliament. Though of Jacobite descent he unfalteringly upheld the Hanoverian interest in 1745, did special service in 1748 by his defense of the Treaty of Aix-la-Chapelle, and was admitted leader of the House. An attempt to prove him guilty of treason or disloyalty to the Crown was unsuccessful, though often obliquely repeated. He was made Attorney-General in 1754 and Chief Justice and Baron Mansfield in 1756. He was a member of the cabinet, without office, for 15 years, but his part in politics waned after he went on the bench. He was still a tpyical Tory, however, and in 1770 sided violently with the government in the political libel trials and was sharply attacked by Junius. His unpopularity steadily increased because of his opposition to Wilkes, whose sentence, however, he greatly lightened because of a technical flaw which he discovered himself, and in general because of his contention in various famous cases of libel that the jury could decide only on the facts and not on any question of law. In 1774 in the case, Campbell *v.* Hall, he decided that countries acquired by British conquest were governed by the general principles of the British constitution; but in regard to the American colonies he insisted that their complaints could not be considered until they had submitted themselves to Parliament. He became Earl of Mansfield in 1776; proposed the coalition of 1779, and in 1780 suffered at the hands of the Gordon rioters because of his sympathy with Catholic emancipation. In 1788 he retired from the bench. Though so unpopular, and though constitutionally a believer

in royal prerogative, Mansfield was a great judge, whose work was not too conservative, and an able, calm, logical debater. Possibly his greatest labor was his revision of the mercantile law.

MANSFIELD, England, a market town and municipal borough in Nottinghamshire, 16 miles north by west of Nottingham, in a deep valley, in the midst of a rich coal district, surrounded by vestiges of Sherwood Forest. There are cotton mills, manufactures of silk and cotton hosiery, lace thread-mills, boots and shoes and cigar-making. It is supposed to mark the site of a Roman station. Pop. 36,888.

MANSFIELD, Mass., town in Bristol County, 24 miles southwest of Boston and 20 miles northeast of Providence, on the New York, New Haven and Hartford Railroad. The town has an excellent high school and modern water and lighting systems. Manufactures include cutlery, jewelry, straw goods, baskets, electrical supplies and ranges. Pop. 5,183.

MANSFIELD, Ohio, city and county-seat of Richland County, on the Pennsylvania, the Erie and the Baltimore and Ohio railroads. Situated 1,200 feet above sea-level, it is said to be the highest city in the State. Only a short distance from the coal fields, it is a modern business and residential city; has eight banks with clearings for 1915 amounting to $28,986,256.59; terminal grain elevators, being the distributing centre for a grain-raising region, and does a large jobbing business in groceries. It is supplied with natural gas; also artesian well water for both fire and domestic purposes. Among the principal buildings are Municipal Library, opera-house, Y. M. C. A., the County Children's Home and also 27 churches of the various denominations. It is the seat of the Ohio State Reformatory. The fire department is paid by the city, and there is also a complete sewage disposal and garbage crematory plant. The industries include the manufacture of watch cases, mattresses, packing boxes, automobile tires and rubber goods, chains, agricultural implements, electrical machinery, stoves, electric mine equipment, artificial stone products, house furnishings, women's clothing, etc. Pop. 24,818.

MANSFIELD, Pa., borough, in Tioga County, on the Tioga River, and on the Erie Railroad, about 108 miles north by west of Harrisburg and 25 miles southwest of Elmira, N. Y. It is in the midst of an agricultural region and near the coal fields and bituminous coal region. It is the seat of a State Normal School and has two libraries, one of about 6,000 volumes belonging to the Normal School, and a City Library containing 5,000 volumes. Pop. 1,800.

MANSFIELD, Mount, in Vermont, one of the highest elevations of the Green Mountains, 4,405 feet; in the northwestern part of the State, about 23 miles east of Burlington. The view from its summit includes the Adirondack and White mountains, Lake Champlain, a large portion of the northern part of Vermont and some of New Hampshire. See GREEN MOUNTAINS.

MANSFIELD COLLEGE, Oxford, England, a theological institution established in 1886 for the education of men for the Nonconformist ministry. It owes its inception chiefly to Congregational support. Its students must be graduates of some recognized university, or undergraduates of Oxford who have passed Moderations. The staff consists of a principal, a vice-principal, three lecturers and a bursar. Mansfield House, at Canning Town (West Ham), is a settlement in connection with the college.

MANSFIELD PARK. This quietly charming novel of manners, published in 1814, is perhaps less popular than some of the other works of Jane Austen, but it is regarded by more than one critic as even superior to them in richness and maturity. As the title implies, the story is built around English country-house life. Fanny Price, an indigent niece, is taken into the family of Sir Thomas Bertram. Overlooked for the most part by Sir Thomas and his wife, subjected to the carping control of the odious Mrs. Norris, Lady Bertram's sister, and neglected or patronized by three of her cousins, Fanny finds her chief consolation in the casual kindness of her remaining cousin, Edmund, whom she grows to love. But Edmund is attracted by the dashing and sophisticated Mary Crawford, who with her brother, Henry, is visiting at the neighboring rectory. Henry, in turn, after various flirtations with the Bertram sisters, pays suit to Fanny. The unfolding of these several relationships by means of seemingly insignificant incidents — dances, excursions, amateur theatricals — constitutes some of Miss Austen's most skilful work and affords her opportunity for those delicately humorous, mildly ironical accounts of the life she knew best, that have made her immortal. Of course in the end Henry and Mary Crawford are eliminated and Edmund loves and marries his Cinderella-like cousin. No single character in this novel is as well known as Mr. Collins of 'Pride and Prejudice' or Miss Bates of 'Emma'; yet the various personages are excellent examples of the author's nice discrimination and marvelous insight. Each character is clearly portrayed though not unduly simplified; each exhibits in varying proportions that mixture of good and evil common to all mankind. In a word, the characters are not types or Elizabethan "humors," but are richly human. 'Mansfield Park' appeals to many classes of readers. It is the best kind of historical novel, for it records vividly the manners and customs of ordinary folk in the Napoleonic era. It is a superb example of a serene, balanced realism, avoiding alike the rose-pink and the dirty drab that Meredith later reprehended. It is an almost flawless instance of pure comedy in fiction. Consult Howells, W. D., 'Heroines of Fiction'; Cornish, Francis Ware, 'Life of Jane Austen'; Smith, Goldwin, 'Life of Jane Austen.'

GEORGE B. DUTTON.

MANSHIP, Paul, American sculptor: b. Saint Paul, Minn., 25 Dec. 1885. He received his early education at the Saint Paul Institute of Arts, where he evinced marked talent for sculpture, and later studied at the American Academy in Rome. His first achievement was the winning of the Helen Barnet prize, in the National Academy of Design in 1913, and he won this again in 1917. He was also awarded a gold medal at the San Francisco World's Ex-

position in 1915. His statues are to be seen in the Metropolitan Museum in New York, Pratt Institute, Brooklyn, Art Institute, Chicago, and other leading institutions.

MANSILLA DE GARCIA, Eduarda, ā-doo-är'dä män-sēl'yä dā gär-sē'ä, Argentine novelist: b. Buenos Aires, 1838. Her maiden name was Mansilla; at 16 she married Manuel R. García, a diplomat, and at 19 published 'El Médico de San Luis,' possibly her best novel. It was followed by 'Lucia Miranda,' a historical novel on the discovery of La Plata, and by 'Pablo, ó la Vida en las Pampas,' which with its fresh description of Argentine life made a great impression in Paris and was praised by Hugo. She was a musician of much talent and wrote, besides novels, several plays.

MANSION HOUSE, in London, England, the official residence of the lord mayor, built on the site of the Old Stock Market in 1739 from designs by George Dance, at a cost of $213,190. It is an oblong building and contains an Egyptian banquet hall accommodating 400 guests.

MANSLAUGHTER, the killing of a human being; in criminal law the second degree of felonious homicide. Murder and manslaughter are distinguished from each other by the intent which causes or accompanies the act. If a homicide be not justifiable nor excusable, and yet be not committed with malice aforethought, it is manslaughter and not murder. It is quite certain that the intent need not be to kill; for while there must be a criminal intent to make a person amenable to law as a criminal, yet if one crime be intended, and in the act of committing it another of a higher character be also committed without intent, the criminal is responsible for this higher crime. The general principle laid down in respect to manslaughter is, that not only a positive intention to commit some crime, but mere negligence, may make one guilty. If any one take upon himself an office or duty requiring care or skill, he is liable for the want of either; and if death be the consequence of his ignorance or carelessness, he is guilty of manslaughter. So if one driving furiously run over and kill a person whom he did not see, or if one in command of a steamer or sailing-vessel by reason of gross negligence run down a boat and some one in it be drowned, this would be manslaughter. So, if any one, whether medical by profession or not, deal with another as a physician, and through gross want of care or skill kill him, or if any one charged with building a house of any kind construct it so badly that it falls and kills persons within or near it; or if in building he drop a stone upon some one passing below and kill him; in all these cases he would be guilty of manslaughter, provided he were grossly negligent in the act causing the death. This is the essential question.

Blackstone defines manslaughter thus: "Manslaughter is the unlawful killing of another without malice either express or implied; which may be either voluntarily, upon a sudden heat, or involuntarily, but in the commission of some unlawful act."

The judicial treatment of this crime, being regulated by statute, varies in the several States. The element of premeditation is not essential to conviction of this crime. There are cases which the law regards as only manslaughter, without evidence of momentary excitement; partly because the law infers that from such a provocation there must be excitement; and partly, perhaps, because the party killed brought his death upon himself by his outrageous wrong. Thus, if a husband detects his wife in adultery, and instantly and purposely takes either her life or the adulterer's, it is only manslaughter. Not so, however, if he waits for a subsequent opportunity, for then the first reason wholly fails, and the killing becomes murder.

In New York State four degrees of manslaughter are defined. The first carries a penalty of not over 20 years' imprisonment, the second degree not over 15 years. The first degree, briefly stated, consists of killing without the purpose of death, when the deceased was engaged in perpetrating or attempting a crime less than felony, and where such killing would be, at common law, murder. Assisting in self-murder is manslaughter in the first degree, as also wilfully killing an unborn quick child by injury to the mother if it would be murder in case the mother died from the injury. The second degree consists in procuring abortion otherwise; killing in the heat of passion without the intent of death, but in a cruel and unusual manner; or killing unnecessarily one attempting to commit felony. The third degree is killing in heat of passion, without intent of death, but with a dangerous weapon; involuntary killing, by procurement or negligence of another, while the person killed is engaged in committing a trespass on property; suffering an animal known to be mischievous to go abroad without care, or keeping it without care, and thereby causing death; receiving wilfully or negligently so many persons in a boat or vessel as to cause death; racing while in command of a steamboat carrying passengers, bursting the boiler, and so killing; killing by a physician while in a state of intoxication. The fourth degree may be said to include all other modes or forms of manslaughter, known as such at common law, and of a milder kind than the preceding. There is much difference between the States in the penalties prescribed. Some States, as Louisiana, Maine and Maryland, assign "not over 20 years" to both first and second degree manslaughter, thus practically leaving the penalty to the judge's discretion; other States, as New Hampshire and South Carolina, call for "not over 30 years," while Texas, West Virginia and Delaware place five years as the greatest punishment. Several States make second degree manslaughter "not over one year" in prison. See HOMICIDE.

MANSURA, MANSURAH, or MANSOURAH, män-soo'rä, Egypt, a town on the Damietta branch of the Nile, 34 miles southwest of Damietta. It has railway connection with Zagazig and Cairo and is the chief depot of the bread-stuffs, cotton, indigo, hemp and flax which this part of the Delta produces. There are also linen and cotton manufactories, etc. Mansurah was founded in 1221 and here in 1250, during the Crusades, Louis IX of France was captured and imprisoned. Pop. about 45,294.

MANTA, män'tä, Ecuador, city, port of entry on the Pacific Coast, about 155 miles southwest of Quito. It has an excellent harbor and steamer connection with nearly all the Pacific

Coast towns of South America. It was founded as early as 1534–35, and for many years its importance has been in being the port of Monticristi, which is about 10 miles inland. The chief exports are coffee and rubber. Pop. 4,000.

MANTALINI, măn-tą-lē'nē, a low and affected character in Dickens' 'Nicholas Nickleby' who lives on the labors of his wife, mantuamaker.

MANTARO, măn-tä'rō, a river in Peru which has its rise in the mountains in the western part of the province of Junin. Its source is about 13,000 feet above the sea. It flows south and east to Huanta, near which it breaks through the mountains and turns northwest which course is continued for about 60 miles, when again it changes and flows northeast to Pisquitini, where it joins the Apurimac River and forms the Ené. The Mantaro is nearly 300 miles long and navigable only a short distance above the junction with the Apurimac. It has extensive water power which is not used except in a few cities.

MANTEGAZZA, Paolo, pä'ō-lō măn-tägät'sä, Italian author and physiologist: b. Monza, Italy, 1831; d. 1910. He was educated at the universities of Pisa and Milan, spent several years in traveling, visiting almost every portion of the globe, after which he returned to Milan and practised medicine there. He was appointed professor of physiology at Pavia in 1860 and in 1870 became professor of anthropology at Florence, where he founded the Museum of Anthropology, also a society and a review of anthropology. He was a member of the Italian Parliament 1865–76 and then became senator. He is the author of many medical and philosophical books; among them are 'Elementi d'igiene' (1875); 'Fisiologia del piacere' (1881); 'Le istasi umane' (1887); 'L'anno 3000' (1897); 'L'amore' (1898), etc. He has also written books of travel and has devoted a share of his attention to political affairs.

MANTEGNA, Andrea, Italian painter: b. Vicenza 1431; d. Mantua, 13 Sept. 1506. His master, Squarcione, was induced by the talents which he displayed to adopt him as a son. The youth employed himself principally in drawing from antiques, and at the age of 16 painted a picture for the grand altar in the church of Saint Sophia at Padua. About 1468 Mantegna entered the service of Ludovico Gonzaga, at Mantua, where he opened a school. Here he painted his great picture, the 'Triumph of Julius Cæsar,' for the tapestry of a palace erected in Mantua. It consists of several cartoons, which have since been transferred to Hampton Court. Gonzaga conferred on him the honor of knighthood in reward for his merit. Innocent VIII invited the artist to Rome to paint in the Belvidere. One of the best of this artist's works is the 'Madonna della Vittoria,' now in the Louvre at Paris, in which Giovanni Francesco Gonzaga is seen returning thanks for the victory gained by him in 1496 over the forces of Charles VIII. The genuineness of this picture is, however, sometimes doubted. There are several others of his works in the Louvre, and an 'Annunciation' in the Dresden Gallery. The New York Historical Society has his 'Crucifixion,' the Metropolitan Museum 'Holy Family,' the Johnson Gallery in Philadelphia his 'Adoration of the Magi.' He was also noted as a line engraver, and left many notable copper plates of both religious and historical subjects. Consult Bell, N. R. E., 'Mantegna' (New York 1911).

MANTELL, Gideon Algernon, English geologist: b. Lewis, Sussex, 1790; d. London, 10 Nov. 1852. For many years he practised as a medical man, and employed his leisure time in studying the strata and fossil remains of the weald district, by which he was surrounded. Through his investigations the fossilized skeletons of the Iguanodon and Hylæosaurus were discovered, the fresh-water origin of the wealden beds demonstrated and many other important facts established in regard to the geology of that district. He published 'The Fossils of the South Downs' (1822); 'Illustrations of the Geology of Sussex' (1822), and the very popular 'Wonders of Geology' (1838); and 'Medals of Creation' (1844). His magnificent collection of fossils was purchased in 1839 for the British Museum.

MANTELL, Robert Bruce, American actor: b. Irvine, Scotland, 7 Feb. 1854. He made his début upon the stage at Rochdale, England, in 1876, and in 1878 played in juvenile rôles with Modjeska in the United States. He then spent three years in England as leading man, returning to New York to play with Fanny Davenport. He became a star and plays at the head of his own company, presenting the leading classical and romantic rôles, including Hamlet, Macbeth, Romeo, Richelieu, etc.

MANTES, mänt, France, a town in the department of Seine-et-Oise, on the left bank of the Seine, opposite Limay, with which it communicates by two handsome bridges connecting the banks with an island in the river, 29 miles west-northwest of Paris. It contains a fine Gothic church, with two lofty towers; a beautiful Gothic tower, the only remains of the church of Saint Maclou; and has manufactures of leather and saltpeter, famous breweries, numerous mills and a trade in leather, corn and wine. William the Conqueror received his death-wound at Mantes. Pop. 8,821.

MANTEUFFEL, măn'toif-fĕl, **Edwin Hans Karl,** BARON VON, German field-marshal: b. Dresden, 24 Feb. 1809; d. Karlsbad, 17 June 1885. He entered the army in 1827 and advanced rapidly, becoming lieutenant-general of cavalry 1861. He took part in the Danish War of 1864, and next year was appointed governor of Schleswig. During the war between Prussia and Austria he commanded the army of the Main, and fought at Hemstadt, Vettingen, Rossbrunn and Würzburg. He served with distinction in the Franco-German War, especially in several actions around Metz, at Amiens, and from June 1871 to July 1873 he commanded the army of occupation in France, and was made field-marshal. In 1879 he was appointed governor-general of Alsace-Lorraine, and in this capacity showed singular want of skill and tact in ruling a conquered people.

MANTI, măn'tī, Utah, city, county-seat of Sanpete County, on the Rio Grande, and on the Denver and Rio Grande Railroad, about 105 miles south of Salt Lake City. Manti was settled in 1849 and incorporated in 1851. It is situated in an agricultural region, where sheep

raising is one of the principal industries. Large coal mines are in the vicinity. The chief industrial establishments are creameries, flour mills, lumber mills and machine-shops. The principal buildings are the Mormon temple, which cost $1,500,000, and the public school building. Pop. 2,432.

MANTINEA, măn-tĭ-nē'ą, Greece, one of the most ancient and important cities of Arcadia, on the frontier of Argolis on the little river Ophis. The site is now known as Palæopoli, and excavations and explorations by the French school at Athens have disclosed the foundations of the walls and buildings of the ancient city. Mantinea was known for its wealth, and famous for the battles fought near it, in 418 B.C., when the Argives, Athenians and Mantineans were defeated by the Spartans, in 385 B.C., when the city was taken and destroyed by the Spartans, and in 362 B.C., when the Thebans under Epaminondas defeated the Spartans, although the victory of the Thebans was purchased with the life of their commander. Mantinea was, in 226 B.C., surprised by Aratus; and in 222 B.C. taken by Antigonus Dosen; on this occasion the town was sacked, and the inhabitants sold as slaves. Another battle was fought near Mantinea 207 B.C., between Machanidas, tyrant of Lacedæmon, and Philopœmen, general of the Achæan League. The latter was victorious, and slew the tyrant with his own hand. The French school at Athens financed an archeologist, G. Fougeres, in uncovering a large area here in 1888. The ancient city was walled, with towers about 80 feet apart. A large mound-shaped theatre was disclosed, a square market hall and paved roads of different eras. Consult Fougeres, G., 'Mantinée et l'Arcadie Orientale' (Paris 1898).

MANTIQUEIRA, măn-tē-kā'ē-rā, **Serra Da,** Brazil, a mountain range which is in the southeastern part of the republic. It is about 75 miles from the Atlantic and extends nearly parallel with the coast for about 200 miles. The eastern end is near Rio de Janeiro. Ranges connected with the Mantiqueira are often included with this range and the name Mitiqueira applied to the whole. Mount Itatiaia, the highest peak, is 9,700 feet above the sea. Several large rivers have their sources in this range.

MANTIS, an orthopterous insect of the family *Mantidæ*. These curious insects, allied to grasshoppers, abound in many parts of the world, and have always excited popular notice, and have been endowed with many supernatural qualities by the ignorant and superstitious of all countries. They are slender, with long, locust-like legs, oval wings, and a long neck-like prothorax, terminating in an angular head with large protruding eyes. The front legs are stout, spiny, fitted for grasping their prey, and are held up in front of them in an attitude that to some suggest prayer. Hence the names praying insect, prophet and the like often given to the more familiar species; to others they suggest other ideas, as of a horse pawing the air, whence our common species of the Southern States (*Stegamomantis carolina*) is known as the "rear-horse," and in Europe these insects are called "camel-crickets." Why it should also be called "mule-killer" is harder to explain; probably it is by confusion with a scorpion also so called. These insects in tropical countries have come to assume various forms and hues similar to the flowers near which they lurk to catch the insects visiting the blossoms — a protective measure which comes under the head of mimicry. A large proportion of the insects upon which they feed are injurious to crops, so that they may be regarded as beneficial to man. Among the Japanese and Chinese they are made to minister to human amusement also, being kept in cages and made to engage in combats upon which the spectators bet money. The eggs of the mantis are laid in an oval mass upon the stem of a plant, and covered with a tough case of hardened mucus, which shows a curiously braided pattern of surface, and is easily recognized.

MANTIS SHRIMP, a large crustacean (*Squilla empusa*) of the order *Stomapoda*, which dwells in burrows between tide-marks along our Eastern coast, and seizes marine worms, and the like, that come within its reach. Its general shape is shrimp-like, but it has strong claws on the second pair of legs, which much resemble the forelegs of a mantis (q.v.), are provided with sharp spines, and are so joined that they can be folded back upon themselves like the blade of a clasp-knife, and so take a firm grip upon the struggling captives. It is quite blind, although the eyes appear to be well formed. A well-known European species is gathered for food by the coast people.

MANTLE, (1) a kind of cloak or loose garment to be worn over other garments. (2) In heraldry the name is given to the cloak or mantle which is often represented behind the escutcheon. (3) A fabric-like covering of salts easily rendered incandescent, for placing over a gas flame to increase the light diffused. See GAS, ILLUMINATING.

MANTLE ROCK, also called **REGOLITH,** the loose unconsolidated débris that results from rock weathering. It includes all soils except those of strictly organic origin. If they have resulted from weathering in place, without removal, the soils are called residual; if they have been carried from their place of origin by wind, glaciers or running water, they are said to be transported. The mantle rock varies greatly in thickness. In some places it is entirely absent, in others it is hundreds of feet deep. See SOIL.

MANTLING, *in heraldry,* an ornament depicted as hanging down from the helmet, and behind the escutcheon. It is considered to represent either the cointise, an ornamental scarf which passed around the body, and over the shoulder; or the military mantle, or robe of estate. When intended for the cointise, it is cut into irregular strips and curls of the most capricious forms, whose contortions are supposed to indicate that it has been torn into that ragged condition in the field of battle. When the mantling is treated as a robe of estate, the bearings of the shield are sometimes embroidered on it. A mantling adjusted so as to form a background for the shield and its accessories constitutes an "achievement of arms."

MANTRAPS, engines for the terrifying of trespassers and poachers (formerly often indicated by the warning notice "man-traps and spring-guns set here"), resembled gigantic rat-

traps several feet long. They may be seen in museums; it has long been illegal to set them (save indoors between sunset and sunrise), as a defense against burglars.

MANTUA, măn'tū-ą, Italy, a fortified northern town, capital of the former duchy, and now of the province of Mantua, 80 miles by rail southeast of Milan, on an almost insular site on the Mincio, which here divides into several arms ending in a marshy and insalubrious lake. Communication is maintained between the islands and mainland by several bridges, the chief of which is Ponte di San Giorgio, 800 yards long. Mantua is written Mantova by the Italians; it is the see of a bishop, the seat of a civil, criminal and mercantile court, and the residence both of a military governor and of a provincial delegate. The most remarkable edifices are the cathedral, after an elegant design by Giulio Romano; the church of Saint' Andrea, conspicuous from a distance by its majestic cupola and Gothic tower; the church of Santa Barbara, containing the mausoleum of Carlo Gonzaga; the church of San Sebastiano; the Corte Reale, formerly the ducal palace of the Gonzagas, a huge irregular pile, now partly used as barracks; the Castello di Corte or old castle of the Gonzagas; the Torre della Gabbia, the Torre del Orologio, and the Torre dello Zuccaro; the Beccheria and Peschiera, or shambles and fish market, both built by Giulio Romano; the house of Giulio Romano, the Palazzo Colloredo, with enormous caryatides supporting its façade; the Palazzo del Té, outside the walls of the town, also built by Giulio Romano, and adorned with some of that master's largest frescoes; the Accademia Virgiliana di Scienze e Belle Arti; the Liceo, the military arsenal, two theatres, one called the Teatro Virgiliano, employed for open-air performances in summer, situated in a fine piazza also named after Virgil, and containing a marble pillar surmounted by a bronze bust of the poet; the library, containing 80,000 volumes; the civic and two foundling hospitals; the Monte di Pietà, the principal house of correction for the whole of Lombardy. The manufactures are increasing. The trade is chiefly in the hands of the Jews, who live in a separate quarter. The principal article of trade is silk. There are machine works, oil and flour mills, tanneries and breweries; there is also a considerable trade in timber, which is floated down the Mincio. Mantua was an ancient Etruscan settlement, and in the time of Virgil, a native of the region, was a Roman town. Charlemagne built its first fortifications. Soon after 1115 Mantua succeeded in making itself independent, and continued so till 1276, when it fell under the iron rule of Buonacolsi or Bonacossi. In 1328 it found better masters in the Gonzagas, who, first as captains, then (from 1432), as marquises, and finally (from 1530) as dukes of Mantua, governed it with great ability, and distinguished themselves by the splendor of their court and their patronage of literature and art. The last of the Gonzaga family who reigned in Mantua was Ferdinando Carlo, or Carlo IV, who, having taken part with the French in the War of Succession, was declared to have incurred a forfeiture by withdrawing his allegiance from his liege lord the emperor of Germany. The Mantuan territory was accordingly annexed to the Austrian possessions in Lombardy, and the remaining part of Montferrat was assigned to Savoy (1708). The fortifications of the town, previously formidable, were completed and put into their modern form by the Austrians and have been kept up to date by the Italian government. In 1796 Napoleon, apparently hopeless of reducing it by any other means, contented himself with keeping it under strict blockade, till famine compelled the garrison to capitulate. After the cession of the western part of Lombardy to Sardinia in 1859, Mantua, with what else of Lombardy remained to Austria, was united to Venetia, and with it was given up to Italy in 1866. The area of the province is 903 square miles, and the population (1915 est.) 360,409. The communal population is 34,507.

MANU, mā'noo, the reputed author of the most renowned law-book of the ancient Hindus, and likewise of an ancient Kalpa work on Vedic rites. It is matter, however, of considerable doubt whether both works belong to the same individual, and whether the name Manu, especially in the case of the author of the law-book, was intended to designate a historical personage; for, in several passages of the Vedas (q.v.), as well as the Mahâbhârata (q.v.), Manu is mentioned as the progenitor of the human race; and, in the first chapter of the law-book ascribed to him, he declares himself to have been produced by Virâj, an offspring of the Supreme Being, and to have created all this universe. Hindu mythology knows, moreover, a succession of Manus, each of whom created, in his own period, the world anew after it had perished at the end of a mundane age.

According to theosophy, the Manu is a great Being (though once a man) who governs the earth planet; other Manus govern other planets, while the Logos (q.v.) created the universe. The word Manu is chiefly used with reference to the author of an ancient renowned Hindu lawbook. This work is not merely a law-book in the European sense of the word, it is likewise a system of cosmogony; it propounds metaphysical doctrines, teaches the art of government, and, among other things, treats of the state of the soul after death. The chief topics of its 12 books are the following: (1) creation, (2) education and the duties of a pupil, or the first order; (3) marriage and the duties of a householder, or the second order; (4) means of subsistence and private morals; (5) diet, purification and the duties of women; (6) the duties of an anchorite and an ascetic, or the duties of the third and fourth orders; (7) government and the duties of a king and the military caste; (8) judicature and law, private and criminal; (9) continuation of the former and the duties of the commercial and servile castes; (10) mixed castes and the duties of the castes in time of distress; (11) penance and expiation; (12) transmigration and final beatitude.

Bühler has proved that Max Müller was right in regarding the extant work as a versified recast of an ancient law-book, the manual of a particular Vedic school, the Mânavas; and holds that the work, the date of which used to be given at 1200 B.C., was certainly extant in the 2d century A.D., and seems to have been composed between that date and the 2d century B.C. There are many remarkable correspondences between this work and the Mahâbhârata, suggesting the use in both of common materials.

MANUAL ACTS, in ecclesiastical and Church hitsory, acts performed by the hands of the celebrant in the mass, chiefly the fraction of the host, and making the sign of the Cross over it before consecration. Both were objected to at the Reformation.

MANUAL ALPHABET, the deaf and dumb alphabet; the letters made by deaf and dumb persons with their fingers.

MANUAL BLOCKING. See BLOCK SIGNAL SYSTEM.

MANUAL TRAINING. As an educational term, manual training includes all handwork used as a means in general education. It differs from trade education through the apprenticeship system in that it emphasizes the educational element rather than the commercial or industrial element. This "hand-training," however, differs from education in its broader meaning, in that it emphasizes manual skill, and makes such by-products as judgment, accuracy, habits of observation, language, etc., more or less important incidents in the results to be attained. The more recent development of vocational training has tended to cast doubt upon the validity of manual training as a part of education, while the advocates of the traditional features of education — literature, history, mathematics, science, philosophy,— have never admitted it to a place in their educational scheme. The term has therefore become restricted to those forms of handwork which are used as agencies in general education as distinct from vocational, trade and industrial education. The manual training advocates continue to hold that habits of accuracy, judgment and observation and sincerity, formed through manual activities, will contribute to these same mental habits as permanent life characteristics. In this they return under peculiar circumstances to the doctrine of formal discipline, approaching the matter in reverse order from the early devotees to this doctrine. Nevertheless it is on this theory that manual training is now holding its place in American public education. When it surrenders this position it must become prevocational or vocational training.

History of Manual Training.— Finland holds the honor of the earliest use of handwork as an agency in education. Between 1858 and 1866 a plan was developed for teaching handwork in the primary schools, and for training handwork teachers for the public schools.

Sweden established handwork as a part of its educational system in 1872. This included carpentry, wood-turning, wood-carving, coopers' work, book-binding, etc., activities selected from the Hus Slöjd occupations from which we have the well-known "Sloyd Work." Sweden was concerned with the physical health of its people as well as the passing of the old system of house industries. It was hoped that this manual work would invigorate the physical and moral health of the people who lived under artificial city conditions; and that industry would be stimulated by a wide diffusion of manual skill. The Swedish nation has now made handwork an integral part of its public school program and has thus laid a broad and sure foundation for the excellent technical and trade schools above.

France adopted handwork in 1873 in the École Salicis, and in 1882 made such work compulsory in all elementary schools. From its very beginning drawing has been emphasized and mathematics has been a closely related subject. Because of this academic work the French have drawn the regular teacher into this handwork movement side by side with a trade teacher who gives the practical work. This relationship between the academic teacher and the trade-teacher has been adopted by other countries and has apparently proved its usefulness.

England opened its first handwork classes in 1886 and to-day all the large centres of population require such work in their schools. The government awards special financial grants to municipalities who give manual training to boys and girls of 11 years and older.

Germany has long emphasized manual instruction for the artisan classes in her population but her emphasis has been on trade or vocational features. Skill of hand has been the purpose, rather than such moral qualities as were sought, for example, by the Swedish system. As a consequence Germany developed trade and occupation schools, rather than manual training courses in the "*real-schulen.*" The Gymnasia of course give no training in handwork. In fact, there has been no general scheme adopted by any considerable portion of Germany. This is probably due to the fact that trade and occupational training were efficiently carried on. Recently, since 1887, some schools have adopted typical manual training courses, and the Manual Training Seminary at Leipsig is the principal source of manual training teachers within the Empire.

Manual training in the United States has depended on private and local initiative. There had been no national movement prior to 1917. The Ethical Culture Society of New York City made the first step by opening handwork classes for small children in 1878 in connection with its workingmen's school. This was followed in 1880 by Washington University, Saint Louis, Mo., under the direction of Calvin A. Woodward. This experiment consisted of a fully equipped manual training high school with a variety of shopwork in wood and metal, mechanical drawing, and in such appropriate academic work as science and mathematics. It was a pioneer school and its success was noticed by many of the large American cities. By 1900 a majority of American municipalities had adopted some form of manual training. Work for girls as well as boys was included in the program. The courses for girls included sewing, dressmaking, millinery, burnt wood, leather and art jewelry; for boys it included joinery, wood-turning, pattern-making, forging, machine-shop, foundry, sheet-metal, printing, electric wiring, etc. In the elementary school handwork has likewise found a large place on the program, beginning in the kindergarten and continuing through the elementary grades. The activities include paper folding and paper cutting, basketry, clay-modeling, wood-carving, raffia work, etc. Correlation with drawing is more and more the rule. The best practice in the public schools now relates drawing to the experiences of the child. Design is the basis of the work and the design of the drawing-class frequently becomes the project of the handwork-class in the upper grades. Manual training in the American high school early developed into a distinctive institution. Its handwork or shop-work program is only remotely

related to industry. The projects are often impractical because they are chosen, not because of their utility or industrial significance but because they illustrate fundamental processes of industry. Type constructions are used as analytical studies of various manufacturing processes. A complete product is not sought nor are such elements as time, commercial value and shop atmosphere made a part of the instruction. The purpose of this typical Manual Training High School is vaguely educational, remotely industrial. As such, it fails to meet the needs of many industrial communities.

The Vocational Motive.—A change of sentiment became apparent immediately after the Saint Louis Exposition of 1904. Educators who had investigated the subject in Europe and America, who saw the display of the nations' handwork, seemed to feel the need of training that related more closely to life motives. Manufacturers demanded industrial efficiency and appeared to have no confidence in the vague results of the typical Manual Training High School which was a traditional school with shop facilities. A demand arose for "shops with schools attached" or with school facilities. Manual training was soon modified so as to add the vocational appeal to boys and girls of 14 years of age and upward. The handwork of the seventh and eighth grades has come to be known as "prevocational" in the sense that the processes of many vocations are taught with the purpose of giving the child an opportunity to choose wisely with the aid of vocational advisers among teachers, parents and industrial or vocational experts. The logical step to follow this "prevocational" work is the trade school so that the advance of the vocational and industrial motives makes the old manual training ideal recede.

Industrial Education and Manual Training.— Industrial education is a more comprehensive term than manual training. It includes all that was at first expected from manual training as a stimulus to efficient workmanship; all that vocational and "prevocational" training propose; all that trade education seeks to secure. The emphasis is now on training and the specialized education pertaining to special industries, while the vague educational results of manual training which it was claimed would come by transfer of faculties, drop below the horizon.

The great demand for skilled workmen in the army and navy has led to the adoption of a national program of industrial education under the direction of the War Department. Colleges and technical schools in all parts of the country are teaching trades indispensable in warfare, using the equipment of former manual training and industrial schools. Thus is impressed on men's minds the utility of industrial skill in sharp contrast with the relative inutility for the work in hand of much of the traditional education, including the typical manual training schools. The organization of industrial education on a national basis is thus assured. It supersedes manual training and takes its place side by side with technical education. See EDUCATION, INDUSTRIAL; EDUCATION, TECHNICAL; VOCATIONAL EDUCATION.

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MANUCODIA, măn-ū-cō-dĭ-ą, in ornithology, a group of birds either belonging or closely allied to the *Paradiseidæ,* and peculiar to the Papuan sub-region. The plumage is glossy steel-blue; the outer and middle toes are united for some distance, and there is an extraordinary convolution of the trachea in the males, to which the loud and clear voice of the birds is owing. Mr. Sharpe divides the Manucodia into two genera: Phonygama and Manucodia proper, of which four species are admitted—*Manucodia chalybeata* (*chalybea*), from the northwest, and *M. comriei,* from the southwest, of New Guinea; *M. atra,* widely distributed over the Papuan sub-region, and *M. jobiensis,* peculiar to the island whence it derives its specific name.

MANUEL I, Camnenus, man'ū-ĕl kŏm-nē'nŭs, a Byzantine emperor: b. about 1120; succeeded his father, Joannes II, in 1143, died in 1180. The valor which he had displayed against the Turks induced his father to bequeath the crown to him rather than to his elder brother Isaac, who was immediately imprisoned by Axuch, the minister of the deceased emperor. Returning from his campaign in Cilicia, Manuel was received with enthusiasm at Constantinople, but was at once involved in wars both in the East and the West, which lasted with brief intermissions through his reign. In 1144 he subjected Raymond, the rebellious Latin prince of Antioch. In 1145 he defeated the sultan of Iconium in successive pitched battles. In 1147 he promised his aid to the new crusade headed by Louis VII of France and Conrad III of Germany, and though he allowed them a passage through his dominions he gave secret information to the Turks.

In 1148 he began the most important war of his reign with Roger, the Norman king of Sicily, who had taken Corfu and prepared to invade Greece. He formed an alliance with the Venetians, who within a year joined him before the fortress of Corfu, which was surrendered after an obstinate siege. He was prevented from invading Sicily by hostilities of the Serbians and Hungarians, instigated by Roger, the former of whom were vanquished in two campaigns, but the latter protracted the war till 1152. In that year he suffered a reverse from the Turks in Cilicia, but his general, John Ducas, gained so great successes in southern Italy that Manuel conceived the project of reuniting the eastern and western empires.

The defeat of Alexis, the successor of John Ducas, by William, the successor of Roger, soon followed; the Sicilian admiral Maius routed the Greek fleet off Negropont, and advanced toward Constantinople; and Manuel therefore accepted an honorable peace in 1155. Those Greek prisoners who were silk-weavers were retained in Italy, and gave origin to the flourishing Italian silk manufactures. In the following years he waged successful wars with Raymond, Prince of Antioch, and Az-ed-din, the Turkish sultan. A new war soon broke out with Gejza, king of Hungary, which was terminated by a disastrous defeat of the Hungarians near the present Semlin. In 1176 he experienced a terrible defeat from Az-ed-din in the mountains of Pisidia, and was obliged to sign a disadvantageous peace. By breaking the treaty and renewing the war he

obtained honorable terms. This broke his health and he died of a slow fever.

MANUEL II, Palæologus, pā-lē-ŏl'ō-gŭs, a Byzantine emperor, born in 1350, succeeded his father, Joannes V, in 1391, died in 1425. At the death of his father he fled from the court of the sultan Bajazet, with whom he had been left as a hostage. The consequence was a war with Bajazet, in which Manuel was supported by an army of Hungarians, Germans and French. The allies, under the command of Sigismund, king of Hungary and afterward emperor of Germany, were defeated at Nicopolis in 1396, with the loss of 10,000 men. Constantinople was besieged, and its fall seemed impending, when the conquests of Tamerlane diverted the arms of the sultan. Manuel visited Italy, France and Germany, vainly seeking assistance from the Western princes. In the conflict between the Tartars and the Turks, he acted with diplomatic skill, and secured peace to his empire. He sent ambassadors to the Council of Constance with instructions to urge a union of the Latin and Greek churches; but his real object was only to obtain aid from the kingdoms of the West, and to alarm the Turks by the negotiations with those kingdoms.

MANUEL II, ex-king of Portugal, younger son of Carlos I: b. Lisbon, 15 Nov. 1889. He was known as the Duke of Beja and scandalous reports of his life in Paris were circulated before it was thought he would succeed to the throne. Consequently his accession on the assassination of his father and the Crown Prince on 1 Feb. 1908 was not the occasion of great popular rejoicing. He took the oath as king on 6 May 1908. His private life continued to alienate the affection of the people and on 5 Oct. 1910 the Republicans overturned his throne and proclaimed a republic. Manuel fled to England where he resided at Twickenham with his uncle, the Duke of Orlĕans. From there in 1911 he directed uprisings in Portugal with the object of abolishing the republic. These proved unsuccessful as did others in succeeding years and the entrance of Portugal into the war of 1914–18 as a member of the Entente appeared to put an end definitely to Royalist uprisings in that country despite huge sums spent by the Germans in propaganda to that end. Manuel married Princess Augustine Victoria of Hohenzollern-Sigmaringen in 1913; the union proved uphappy and a separation resulted.

MANUEL, Don Juan, Spanish prince and author: b. Escalona, Spain, 5 May 1282; d. 1349. He was a nephew of Alfonso X, and cousin of Sancho IV. His public life was a restless and turbulent one, but his chief claim to remembrance comes from the fact that he was one of the first and one of the best of Spanish prose writers. He wrote in a style of singular simplicity and charm, and few Spanish authors have succeeded so well in giving to their words the calmness, the weight, the richness which come only from long experience and reflection. His principal work that remains is 'Libro de Patronio,' more commonly known as 'El Conde Lucanor,' which has been translated into the French and German languages.

MANUFACTURERS, National Association of, an American association organized in Cincinnati in 1895. It had three primary objects — increasing the export trade; influencing State and national legislation; and arbitrating labor disputes. The Association maintains a general office in New York City and issues numerous confidential reports and bulletins for the exclusive use of its members. The Association is opposed to all boycotts and blacklists, but is not opposed to labor organizations, though it has resisted many of their rulings, and is popularly considered as antagonistic, because of the vigor with which it pushed the now famous suit against the American Federation of Labor, for its boycott of the Bucks Stove and Range Company. This was a long-fought test case, and the manufacturers won, stopping all official boycotting. Since 1913 the Association has directed its attention largely against the Independent Workers of the World, generally with success. The Manufacturers' Association has given considerable effort to promoting constructive legislation to aid manufacturers, and has made some gains in patent law, but signally failed in securing better terms from the Post-Office Department. It publishes *American Industries* (monthly), which has 35,000 circulation, and is edited by F. W. Keough; and *The American Trade Index* (monthly).

MANUFACTURES IN THE UNITED STATES. See UNITED STATES, COMMERCIAL AND INDUSTRIAL DEVELOPMENT OF.

MANUL, mā'nŭl, the common wildcat of Siberia and Tibet. It is smaller than the European wildcat, stockily built, has a moderately long tail and a coat of long hair. The general color is yellowish white, with a blackish mark on the chest and upper part of the fore legs, and some dark lines across the haunches and ringing the tail. Two black lines on the cheeks and a black spot behind the short ear are other distinguishing marks. There is a very curious similitude of appearance between this animal and the pampas cat of Patagonia.

MANUMISSION, in Roman law, the solemn ceremony by which a slave was emancipated. Constantine the Great allowed the Christian masters to emancipate their slaves before the altar on festival days, and especially at Easter, by placing the deed of emancipation on the head of the freedman in the presence of the congregation. See EMANCIPATION; EMANCIPATION IN LATIN AMERICA; EMANCIPATION PROCLAMATION.

MANURES AND MANURING. See AGRICULTURAL CHEMISTRY; FERTILIZERS.

MANUSCRIPTS (Latin, *manuscriptus,* written by the hand), are literally writing of any kind, whether on paper or any other material, in contradistinction to printed matter. Previous to the introduction of printing all literature was contained in manuscripts. All the existing ancient manuscripts are written on parchment or on paper. The paper is sometimes Egyptian (prepared from the real papyrus shrub), sometimes cotton or silk paper (*charta bombycina*), which was invented in the East about the year 706 A.D., and used till the introduction of linen paper, and in common with this till the middle of the 14th century; sometimes linen paper, the date of the invention of which, though ascribed to the first half of the 13th century, on the authority of a document of the year 1243, written on such paper, is

nevertheless exceedingly doubtful. The earliest mention of quill pens is in the 7th century. The most common ink is the black, which is very old. The oldest, however, was not mixed with vitriol, like ours, but generally consisted of soot, lamp-black, burned ivory, pulverized charcoal, etc. Red ink of a dazzling beauty is also found in ancient times in manuscripts. With it were written the initial letters, the first lines, and the titles, which were thence called *rubrics,* and the writer *rubricator.* More rarely, but still quite frequently, blue ink is found in ancient manuscripts; yet more rarely green and yellow. Gold and silver were also used for writing either whole manuscripts (which, from their costliness, are great rarities), or for adorning the initial letters of books. With respect to external form, manuscripts are divided into rolls (*volumina,* the most ancient way, in which the troubadours in France wrote their poems at a much later period) and into stitched books or volumes (properly *codices*). Among the ancients the writers of manuscripts were mainly freedmen or slaves (*scribæ librarii*). Some of the professional copyists in Rome were women. When Origen undertook the revision of the Old Testament (231 A.D.), Saint Ambrose sent to his assistance a number of deacons and virgins skilful in caligraphy. Subsequently the monks, among them the Benedictines in particular, were bound to this employment by the rules of their Order. In all the principal monasteries was a *scriptorium,* in which the *scriptor* or scribe could pursue his work in quiet, generally assisted by a *dictator,* who read aloud the text to be copied; the manuscript was then revised by a *corrector,* and afterward handed to the *miniator,* who added the ornamental capitals and artistic designs.

It is more difficult to form a correct judgment respecting the age of Greek manuscripts from the character of the writing than it is respecting that of Latin manuscripts. In general it is to be remarked tha' in a Greek manuscript the strokes are lighter, easier and more flowing the older it is, and that they become stiffer in the progress of time. The absence or presence of the Greek accents is in no respect decisive. Some Greek papyri are earlier than the Christian era, but most are not earlier than about the 6th century. The characters in Latin manuscripts have been classified partly according to their size (*majuscula, minuscula*), partly according to the various shapes and characters which they assumed among different nations or in various periods (*scriptura Romana antiqua, Merovingica, Longobardica, Carolingica,* etc., to which has been added since the 12th century the *Gothic,* so called, which is an artificially pointed and angular character); and for all of those species of writing particular rules have been established, affording the means of estimating the age of a manuscript. Before the 8th century punctuation marks rarely occur: even after the introduction of punctuation, manuscripts may be met with destitute of points, but with the words separate. Manuscripts which have no capital or other divisions are always old. The *catch-word,* as it is termed, or the repetition of the first word of the following page at the end of the preceding, belongs to the 12th or subsequent centuries. The fewer and easier the abbreviations of a manuscript are the older it is. Finally, in the oldest manuscripts the words commonly join each other without break or separation. The division of words first became general in the 9th century. The form of the Arabic ciphers, which are seldom found in manuscripts earlier than the first half of the 13th century, also assists in deciding the age of a manuscript. Some manuscripts have at the end a statement when, and commonly also by whom, they were written (*dated codices*). But this signature often denotes merely the time when the book was composed, or refers merely to a part of the manuscript, or is entirely spurious. The most ancient manuscripts still preserved are those written on papyrus which have been found in Egyptian tombs. Next to them in point of age are the Latin manuscripts found at Herculaneum, of which there is a rich collection in the Naples Museum. Then there are the manuscripts of the imperial era, among which are the Vatican Terence and Septuagint and the Biblical codices in the British Museum. Since the middle of the 19th century many manuscripts of Greek writings have been found in Egypt, among the chief being that containing the orations of Hyperides, several containing parts of the works of Homer, Plato, Demosthenes, etc., that in which occurs a portion of the Antiope of Euripides, and the almost complete text of Aristotle's work on the constitution of Athens. It was the custom in the Middle Ages to obliterate and erase writings on parchment for the purpose of writing on the materials anew, and these manuscripts, many of them of great value, are known as "palimpsests." This custom ceased in the 14th century, probably because paper came then more into use. See LIBRARIES; MANUSCRIPTS ILLUMINATED; MANUSCRIPTS OF THE BIBLE; PALEOGRAPHY; PAPYRUS.

ANUSCRIPTS, Illuminated, are those whose text is heightened and brightened by vignettes and other decorations in colors, gold and silver. The verb to *illuminate* first occurs in the beginning of the 18th century; and means to decorate an initial letter, a word, or a text of a manuscript with gold, silver or brilliant colors, or with elaborate tracery, miniature illustrations and designs. The older verb was to *enlumine* (Old French *enluminer;* late Latin, *inluminare;* classic Latin, *illuminare*). It occurs, A.D. c. 1366, in Chaucer, A. B. C., 73, "Kalendeeres enlumyned ben"; A.D. c. 1400, 'Roman de la Rose,' 1695, "For it so welle was enlomyned"; A.D. 1430, Lydgate, 'Chron. Troy,' Prol., "For he enlumineth by craft and cadence this noble storye with many freshe coloure of Rhetorik." Illumination differs from painting, according to Ruskin, 'Modern Painters' (1856, Vol. III, iv, viii, sec. 9), in that "illumination admits no shadows, but only gradations of pure colour." The earliest writing of many peoples was by means of pictures. Witness the pictographs of Sumeria, that later evolved into Babylonian cuneiform script; the hieroglyphic writing of Egypt; the crude scrawls of our American Indians; and

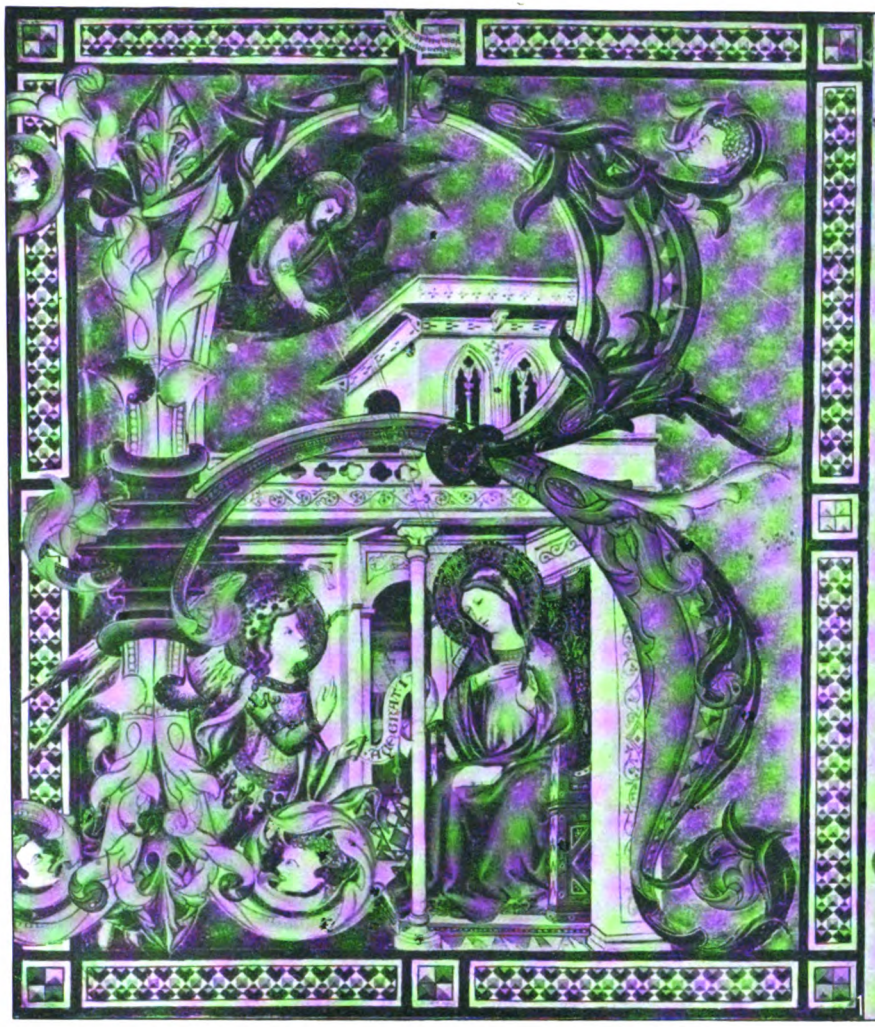
the Aztec picture-writing, which still defies epigraphists. It was but natural that an art arose of embellishing these pictographs. Fifteen centuries before Christ the papyrus rolls that contain the ritualistic 'Book of the Dead' were illuminated with brilliantly colored scenes. In due time the art of illumination passed over to peoples whose script was alphabetic; it always remained an art of beautiful writing. There is truth, though characteristically narrow and dogmatic in expression, in the saying of Ruskin, 'Lectures on Art' (1870, v. 138): "Perfect illumination is only writing made lovely; the moment it passes into picture making it has lost its dignity and function."

I. Illumination in the East. 1. In Egypt. — The earliest specimens of illumination are on Egyptian papyrus rolls. Ritual directions are in red; hence the mediæval *rubric*. Profile portraits are inserted into the text. Agricultural and household scenes are interspersed between hieroglyphic signs. From the Egyptians the art of illumination reached the Hellenic folk of Alexandria. A 4th century B.C. papyrus manuscript of the poems of Timotheus, found at Abûsir, has a bird as a punctuation mark. Not until the Christian era do miniatures adorn the text. A 1st century A.D. Greek papyrus (Bibliothèque Nationale de Paris) shows a text that is adorned with miniatures in bold relief. A Berlin papyrus, Kaiser Friedrich Museum, illustrates the cure of a demoniac by Jesus. While in Hellenic Egypt the art of illumination thus progressed, the Coptic artists carried on a separate tradition from their ancient Egyptian forebears. A Coptic chronicle, dated 392 A.D. (Goleniscey collection) has a wealth of miniatures illustrative of the months, the provinces of Asia, the rulers of Rome, Lydia and Macedonia, together with the destruction of the Serapeum under the direction of the patriarch, Theophilus. The Morgan collection of Sahidic manuscripts, of the 9th and 10th centuries, contains a dozen manuscripts with miniatures of the Virgin and her Son, angels, martyrs, saints, hermits; and almost all of the 58 manuscript volumes of this remarkable Coptic library are illuminated with marginal decorative schemes of animals and plants.

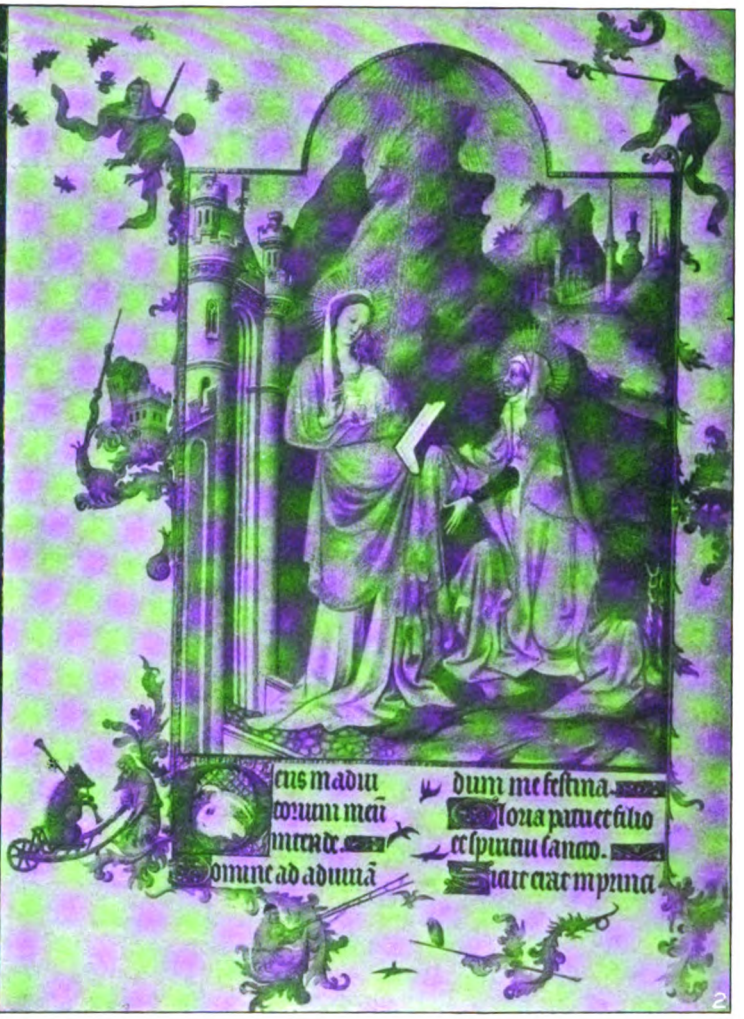
2. In Syria. — The monks of Syria show the traditions of the Semitic orient in the illumination of manuscripts. Saint Augustine, 'Adv. Faustum' (xiii, 6, 18), refers to the miniature illustration of Persian parchments. From the 5th century, there were monastic schools for illumination in Mesopotamia and Syria. The Syriac Evangeliary, 586 A.D., the work of Rabbula at Zagba in Mesopotamia, now in the Laurentian Library, Florence, is an exquisite work of art; the miniatures represent the Crucifixion, etc.; the marginal schemes are geometrical, and contain flowers, birds, etc. Some Hellenistic influence is noticeable; but Semitic traditions dominate in the Syriac school of illuminating. To this school belong also the extant Armenian illuminated manuscripts. Three evangeliaries, books of pericopic readings from the Epistles and Gospels, show the most beautiful work of Armenian miniaturists: that of Etschmiadzin, 10th century, copied from a 6th century model; that of Queen Mlke, 902 A.D., Monastery of the Mechtarists, Venice; and the Tübingen Evangeliary, 1113 A.D. Mohammedan illumination copied Syriac in many Arabic, Turkish and Persian manuscripts, chiefly of the Qûran. The decorative work is often rich in its red, blue and gold cufic characters.

3. The Byzantine School. — In the Hellenistic speaking parts of the Byzantine Empire, the traditions of ancient Greece held sway; although iconoclasm interfered for a while with the progress of miniature painting, and Syriac influences were strong. Previous to the destructive vandalism of the iconoclasts, Byzantine miniaturists beautified the great 6th century purple parchment, Biblical codices: L, *Vienna Genesis*, silver letters; N, *Cod. Purpureus*, silver letters, Gospels, most of manuscript at Petrograd; Σ, *Cod. Rossanensis*, silver letters, Matthew and Mark, at Rossano, in Calabria; Σb, *Cod. Sinopensis*, gold letters, Matthew, in the Bibliothèque Nationale de Paris; Φ, *Cod. Beratinus*, Matthew and Mark, at Berat, Albania. These illuminated manuscripts contain Biblical scenes, the bearded face of the Christ, etc.,— all in miniature. To this period of Byzantine illumination belongs the 'Roll of Joshua,' 11 yards long, at the Vatican, which pictures the story of the great leader; and the manuscript of Dioscorides, at Vienna, 472 A.D., containing portraits of physicians that were copied from originals. All this early Byzantine illumination was along broad lines, free from stereotyped forms,— save the hieratic and fixed faces,— classic in artistic merit, brilliant in coloring, and profusely decorated with gold.

Iconoclasm during the 8th and 9th centuries wrought havoc to the art of illumination in the Byzantine Empire. Precious manuscripts were recklessly destroyed or ruthlessly mutilated. The artists of the iconoclastic period substituted ornamentation for miniature; flora, fauna and geometric forms for figure-painting. An instance of their work is the 'Evangeliary' at Bibliothèque Nationale de Paris, Gr. 631. The triumph of image-worship, 842 A.D., brought about a return to the painting of figures. The 10th to the 12th centuries were the most glorious period of Byzantine miniaturists. About 40 years after the restoration of image-worship, the 'Sermons of Saint Gregory of Nazianzen' (Bibliothèque Nationale de Paris, Gr. 510), 880 c. A.D., were executed, and embellished by a series of large, beautiful miniatures. The 'Paris Psalter,' dating from the 10th century (Bibliothèque Nationale de Paris, Gr. 139), has scenes of the life of David, reproduced from 3d or 4th century models, that vie with the frescoes of Pompeii in freshness and brilliancy. The 'Homilies of Saint John Chrysostom,' Paris, a manuscript which belonged to Nicephorus III (1078–81 A.D.) is likewise a good example of Byzantine illumination at its maturity. The Psalter and the Menologion, a brief sketch of the lives of the saints for each day, were at this time most frequently decorated. The 'Vatican Psalter' (1059 A.D.), in the Barberini Library; and the Menologion of Basil II (976–1025 A.D.) in the Vatican, are rich in miniatures of brilliant coloring. Here should be mentioned the Slavic school of illumination. It was Byzantine at first; and gave us the 'Chloudov Psalter,' 9th century, at Moscow. Between the 12th and 16th centuries, a national style appeared, which is characteristic of many of the numerous and richly illumined manuscripts of the libraries and museums of Petrograd and Moscow.



1 Single Leaf, perhaps from a Choir Book, Sienese Style (Early 15th century)



2 Illuminated Page from the 'Tres Riches Heures' of Jean, Duc de Berry (1400 A. D.)

EXAMPLES OF ILLUMINATION (13th–16th CENTURY), FROM MSS. IN THE BRITISH MUSEUM

1 Psaltery (about 1470)
2 Gospels (1275 A. D.)
3 Psaltery and office (14th century)
4 Office of the Dead (Early 16th century)

II. Illumination in the West. 1. Early Italian.— As manuscript writing, so illumination began in the East, and was thence taken over by the West. Pliny, 'Historia Naturalis' (xxv, 8) is witness to miniature-painting in Rome during the 1st century B.C. Martial (xiv, 1865) speaks of a parchment containing a portrait of Virgil. Varro had some 700 such miniature portraits. The most ancient illuminated manuscripts probably of western provenance are: the fragmentary 'Iliad,' 3d century, Ambrosian Library, Milan; the Vatican Virgil, the 'Schedæ Vaticanæ,' 4th century, Vat. Lat. 3225, with 50 miniatures; the 'Codex Romanus,' another Vatican Virgil. Here be it noted that Latin illuminators gave us the word *miniature,*— from the Latin *minium,* which means red lead or cinnabar,— the vivid-red lead oxide used as a pigment. Hence also is *minare,* to paint in miniature; together with *miniator,* the miniature-painter. Early Italian illumination is not very well known to the historian of art. Byzantine art reacted on Italian; and this reaction is marked in mosaics, early Italian painting, and the earliest illumination of manuscripts in southern and central Italy. Through Italy, the East influenced the illuminators of the Frankish Empire.

2. Celtic Illumination.— It was during this period of decline of illumination in the West that the Irish school, as early as the 7th century, broke completely away from the copying of ancient models and inaugurated its own style of book-ornamentation. The individuality of the artists, the civilization and character of their race, were expressed in an art that reached the very height of perfection and made its influence felt in continental Europe. The Celtic initials, margins, and full-page designs are easily recognized by their great intricacy of interlacing spirals, zigzags, and ribbons, that entangle animal and human shaped fancies, knots, and other designs,— all executed with a marvelous precision of mathematical accuracy, graceful delineation, delicate touch, brilliant coloring, and most fecund imagination. Irish illumination is decidedly oriental in conception and execution; and seems to point back to the ancient civilization of the race, before the Celtic migration from the steppes of Asia, across Asia Minor, by way of Austria, Switzerland, Spain and France. No trace is found of classic influences. Foliage is absent. Kinship with the sculpture on stone and jewels in barbaric Ireland is marked. The wonderful decorative schemes are more like to the Arabic than to any other; and the human form is depicted with a geometrical symmetry that is characteristic of Coptic workmanship. The finest example of Celtic illumination is in Q, 'Codex Kenanensis,' the Book of Kells, 8th century, Vulgate Gospels, in Trinity College, Dublin. Its pages are replete with brilliant, exquisite designs, testifying to a minuteness and delicacy of precision that are a marvel to art critics. The Celtic art of illumination reached Iona through Saint Columba's foundation there; and the monks of Iona (635 A.D.) brought their faith and their art to Lindisfarne, or Holy Isle, off the Northumbrian coast. Here was executed in Celtic style the 'Lindisfarne Gospels,' 8th century, now in the Cottonian collection of the British Museum. Other fine works of the Celtic school of illuminators are the 'Book of Deir'; Δ, *Codex Sangallensis,* 9th or 10th century, Gospels in Greek and Latin, at Saint Gall, Switzerland. In England, the Celtic school of illumination dominated, although manuscripts brought by Saint Augustine from Rome introduced a classic influence. The 'Utrecht Psalter' (800 A.D.) is representative of the Celtic style in transition. It shows crude attempts at drapery effects. In Anglo-Saxon miniatures, frames of foliage and fluttering draperies become characteristic. The 'Benedictionale' of the see of Devonshire is the most elaborate specimen of 10th century Anglo-Saxon miniatures. The Norman Conquest saved Anglo-Saxon illumination from the fantastic exaggerations into which it was sinking.

3. Carlovingian Illumination.— When Charlemagne became emperor of the West (800 A.D.) illumination was rapidly revived. The Celtic style provided to this new school its interlacements; Byzantine art was drawn upon for the painting of the human figure. Gold was used profusely in letters as well as illustrations. Large initials were almost the rule. Ornamentation was luxurious. Miniatures represented historical characters, symbolical themes, the arts, signs of the zodiac, virtues, vices, etc. Notwithstanding the gorgeous effect of purple vellum, a dazzling abundance of gold, and a brilliance of decoration, the Carlovingian illuminated manuscripts show a tendency to coarseness of workmanship and clumsiness of figure-painting. This tendency is in part offset by the purer style of the Celtic influence. The best examples of early Carlovingian illumination are: the 'Evangeliary,' said to have been illuminated by Godescalc for Charlemagne in 787 A.D., whose text is in gold letters on a purple ground, and whose every page is illustrated with a different decorative scheme; another 'Evangeliary' of Charlemagne, at Vienna; the 'Bible of Theodulf,' bishop of Orleans, at Paris and Le Puy; the 'Sacramentary,' written for Drogon, son of Charlemagne and bishop of Metz; the 'Evangeliary of Lothair,' Paris; and the 'Bible of Charles the Bald,' presented by Count Vivien, abbott of Saint Martin of Tours. It was about the time of Charles the Bald, second half of the 9th century, that Carlovingian illumination reached its greatest perfection.

4. Gothic Illumination.— The 10th to the 12th centuries show a decadence of Frankish illumination. After the 'Regensburg Gospels' (11th century) miniatures become more coarse and clumsy, colors are dull. Toward the end of the 12th century, a renascence of illumination is visible in both Germany and France. Gold is now laid on in leaf, and not in liquid; burnishing makes the illumination most brilliant. The old illuminators were monks; now laymen take up the art. The initials are smaller, but more artistic; they often contain miniatures of illustration or interpretation of the Biblical text. Hundreds of miniatures beautify the 'Picture Bibles' of the 13th century, or interpret the 'Sermon Bibles' of the period. Gothic features are introduced,— gables, pinnacles, rosé and quatrefoil decorations. The human figure is painted with realism; 13th century costumes are preserved to us in an accuracy of coloring. During the 14th century, there is a departure

from conventional foliage, and a reproduction of garlands and flowers from nature. And with the flowers are intermingled peasants, birds, animals, butterflies, etc.,— all true to life. The 'Breviary of Belleville,' (Bibliothèque Nationale de Paris, Lat. 10483–4) the work of the famous Parisian illuminator, Jean Pucelle, together with Mahiet Ancelet and J. Chevrier; the 'Book of the Miracles of Our Lady,' Soissons; 'Queen Mary's Psalter' (British Museum), done for Mary Tudor, are all exquisite works of 14th century craft. The golden age of illumination continues during the early 15th century. Even at the outset of the Renaissance, the Gothic manner prevails. Books of Hours are the special feature. Such is the 'Très Riches Heures' of the Duke of Berry, Musée Condé, Chantilly, by Pol de Limbourg, containing miniatures of the various châteaux of the duke, and portraying marvelous aerial perspectives in landscape scenery,— the effects of snow, starlight, blazing sunlight and dull autumn shades. Other beautiful *Horæ* are the 'Grandes Heures,' by Jacquemart de Hesdin; 'Très Belles Heures,' and 'Heures de Turin,' of the same Flemish school; and the 'Hours of Anne of Brittany' (1508 A.D.). This last work marks the end of the art of illumination. The Renaissance, together with the invention of printing, were fatal to miniature painting of books, and to the illumination of their carefully written pages.

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MANUSCRIPTS OF THE BIBLE are written as opposed to printed copies of the whole Bible or a part thereof. All these manuscripts, whether of the original text or of an ancient version, so long as they were done before the invention of the art of printing, are important in the science of the textual criticism of Holy Writ. This article will contain a brief introduction on Bible manuscripts in general, followed by a summary account of the chief Hebrew, Greek, Latin, Syriac, Armenian and Coptic manuscripts of the Bible. Manuscripts of the Arabic, Ethiopic, Slavic and other early versions of Scripture do not witness to the earliest type of New Testament text; they are amply treated in technical dictionaries of the Bible.

I. Bible Manuscripts in General.— There are three classes of Bible manuscripts — papyrus, vellum and palimpsest — to which attention should be called.

1. *Papyrus Manuscripts.*— While Babylonian scribes were impressing upon endurable clay the cuneiform, or wedge-shaped, ideographic records of the style, Egyptian reed-writing with ink upon papyrus developed almost at the same pace. The name of this primitive paper is that of the plant which provided its raw material. The *papyrus,* πάπυρος, probably an Egyptian loan-word,— was a rush of thick triangular stalk.

Its main root, Theophrastus tells us, was about 15 feet long and as thick as a man's wrist. Likely the bullrush, *gómér,* the wicker out of which was plaited the ark that contained the infant Moses, was the Nile papyrus. The outer coat of this Egyptian water-plant was peeled off, the pith was cut into strips and these were glued together transversely to form the first known writing paper. Sheets of papyrus were very fragile, became brittle in air, crumbled with use, could not resist the disintegrating force of moisture and were quite impracticable for book-form. Hence all papyrus manuscripts have been lost to us, save such as were buried in the exceedingly dry soil of Upper and Middle Egypt. For many years, the ignorant *félláhín* wantonly destroyed these precious records of the past. Now scientific excavators are preventing this ruthlessness, and constantly adding to the world's various collections of papyrus manuscripts. The most ancient papyrus document is a record of the reign of the Egyptian King Assa, B.C. 3580–3536; and the earliest literary papyrus work extant is the Prisse papyrus of Paris, written in the 5th dynasty, c. B.C. 2500. During the first three centuries of Christianity papyrus was the ordinary writing paper of the Roman Empire. It was used by the Arabs until the 8th century, when modern paper was invented. The sacred writers or their scribes most likely used ink and rolls of fragile papyrus for the *autographa* of the New Testament (2 Corinthians iii, 8; 2 John, xii). These precious documents seem to have perished during the early 2d century. No trace of them is found in the writings of either the Apostolic or Apologetic Fathers,— unless we except Tertullian's words, "the authentic letters of the Apostles themselves," which are now generally set aside as rhetorical.

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2. *Vellum Manuscripts.*— Pliny ('Historia Naturalis' xiii, 1) is witness to the use of vellum for documentary purpose before the time of Christ. Saint Paul (2 Timothy iv, 13) employed both papyrus-rolls, *τὰ βιβλία,* and parchment, *μεμβράνας.* In the 3d century, vellum began, outside of Egypt, to supersede papyrus; and in the early 4th century, the codex or parchment book-form gained complete victory over the papyrus-roll. To this century belong the earliest extant Bible manuscripts of any thing but fragmentary size.

3. *Palimpsests.*— Some of our most important vellum manuscripts are palimpsests (— Lat. *palimosestum,* παλιμψηστός "scraped again" i.e., manuscripts that were scraped a second time with pumice-stone and written upon anew). The reckless charge of wholesale destruction of Biblical manuscripts by the monastic scribes of palimpsest works has not been substantiated. Wattenbach ('*Das Schriftwesen im Mittelalter,*' 1896, pp. 299 ff), a leading authority on the subject, notes that a Greek synod, A.D. 691, forbade the use of any but ut-

terly unserviceable Biblical or Patristic manuscripts for palimpsest-writing. According to Wattenbach, "more precious manuscripts, in proportion to the existing supply, have been destroyed by the learned experimenters of our time than by the much abused monks of old." The deciphering of a palimpsest may at times be accomplished by merely soaking it in clear water. The "learned experimenters" use some chemical reagent, in order to bring back the original writing. Such chemical reagents are an infusion of nutgalls, Gioberti's tincture and hydrosulphuret of ammonia; all do harm to the manuscripts.

II. Hebrew Manuscripts.— Certain parts of the Hebrew Bible,— Daniel ii, 4b–vii, 28, and Ezra iv, 8–vi, 18, together with vii, 12–26,— are not in Hebrew, but in Aramaic. These Biblical Aramaic portions, in the language that the exiled Jews adopted during their Babylonian captivity (B.C. 586–536), are here treated conjointly with the Hebrew text into which they have been received. We shall briefly sum up the age, number and worth of the Hebrew manuscripts of the Bible.

1°. *Age.*— Textual criticism divides the Hebrew text of the Bible into the Masoretic and pre-Masoretic.

The Masoretic text is that of our complete Hebrew manuscripts. It represents the Masorah. This authoritative textual tradition was begun in the 1st century B.C.; was fixed in its consonantal readings during the Talmudic period (A.D. 300–500); and received the vowel points about the 8th century of our era. The pre-Masoretic text includes chiefly the readings that are not witnessed to by Masorah. The earliest manuscript of the Hebrew Bible, and probably the oldest extant Biblical manuscript, is the Nash papyrus. There are four fragments, which, when pieced together, give 24 lines of a pre-Masoretic text of the 10 commandments and of the *shemá* (Exod. xx, 2–17; Deut. v, 6–19, and vi, 4–5). The writing is without vowels, and seems paleographically to belong to not later than the 2d century. Another witness to the pre-Masoretic text is the Samaritan Pentateuch, which is probably pre-exilic in origin. The earliest Samaritan manuscript extant is that of Nablus, once rated very ancient and now assigned to the 12th or the 13th century. The newly-discovered Hebrew '*Ecclesiasticus*,' represented by fragmentary manuscripts of the 10th or 11th century, preserves parts of the pre-Masoretic text of a book until recently thought to have been written in Hellenistic.

All other Hebrew manuscripts of the Bible are Masoretic, and belong to the 10th century or later. At most 9 or 10 are earlier than the 12th century. The earliest are *Codex Petropolitanus*, dated A.D. 916; the *Saint Petersburg Bible*, dated A.D. 1009; and *Codex Oriental*, 4445, British Museum, which Ginsburg assigns to A.D. 820–850.

2°. *Number.*— Kennicott ('Dissertatio Generalis in Vetus Testamentum Hebraicum,' 1780), collated 16 Samaritan and 638 Masoretic manuscripts. De Ross; ('Variæ Lectiones,' 1784), brought the number of Masoretic manuscripts up to 1,375. No one has since surpassed this critical work of De Rossi on the Masoretic text. Some 2,000 Masoretic manuscripts gathered in the Crimea by Firkowitsch, await critical study in the Imperial Library of Petrograd. Consult Strack, 'Die biblischen und massoretischen Handschriften zu Tschufut-Kale' (In *Zeits. für luth. Theol. und Kirche*, 1875).

3°. *Worth.*— This rich store of some 3,375 manuscripts promises no very important critical results. For they all depend on an archetype of the 2d century A.D.; and are singularly alike in accuracy of reproduction. The Masoretes were most detailed in their painstaking efforts to hand down the text of this archetype. The Scribes counted words and consonants of each book; noted the middle words and middle consonants; retained peculiarities of script,— such as broken letters, inversions, consonants that were too small or too large, dots out of place, etc. All these oddities were handed down as God intended, and received mystical interpretations. Here is an instance. In Genesis ii, 4, *behibbāre' ām*, "when they were created," the letter *h* is unduly small. The rabbis handed down this peculiarity as God inspired; translated the word, "In the letter *h* he created them"; and then disputed what that meant. Hence the importance of manuscripts of the early versions of the Old Testament, so as to reach a pre-Masoretic text.

Bibliography.— Kraft and Deutsch, 'Die handschriftl. hebräischen Werke der k. k. Hofbibliothek' (1857); Strack and Harkavy, 'Catalog der hebr. Bibelhandschriften der kaiserlichen Bibliothek'. (1875); Schiller-Szinessy, 'Catalogue of the Hebrew Manuscripts' (preserved in the University Library, 1876) Assemani, 'Bibliothecæ Apostolicæ Vaticanæ Codices Orientales' (1756); Mai, 'Appendix to Assemani' (1831); Neubauer, 'Facsimiles of Hebrew Manuscripts' in the Bodleian Library (1886), and 'Catalogue of the Hebrew Manuscripts' in the Bodleian Library and in the College Libraries of Oxford (1886).

III. Greek Manuscripts.— Textual critics divide Greek manuscripts of the Bible into uncials and minuscules. Uncial manuscripts are written in large disconnected letters that vary in force so as to indicate the time and place of provenance. Words are not separated; accents and punctuation marks are not used; no great variety of script is admitted; ligatures are employed for the most ordinary words; paragraphs are marked off by small lacunas. The decadence of elegant uncial writing begins in the 6th century; twists and turns are given to certain letters. In the 7th century manuscripts still greater freedom of flourish is allowed the scribe; accents and breathings are introduced, and the script leans to the right. By the 10th century the writing in Biblical manuscripts begins to be more or less cursive; these manuscripts are called minuscules. The letters are now small, connected and written with a running hand. Cursive writing holds sway in Biblical manuscripts until the 16th century. In A.D. 1514, the Greek New Testament was for the first time printed.

1°. *Old Testament Greek Manuscripts.*— Traces of the version of Aquila (c. A.D. 130) are found in: (1) fragments of Origen's third columns, written as marginal notes to some manuscripts of the Septuagint; (2) the Milan palimpsest of the Hexapla, a 10th century copy found by Mercati in 1896, containing about 11 psalms; (3) the Cambridge fragment,

7th century, giving parts of Psalm xxi.— Cf. Taylor, 'Cairo Genizah Palimpsests' (1900); (4) the Cairo fragments of the 4th and 5th centuries: three palimpsests (containing 1 Kings xx, 7–17, 2 Kings xxviii, 11–27), published by Burkitt in 1897; also four portions of the Psalms (89:17 — 91:10, 95:7 — 96:12, 98:3, 101:16 — 102:13) published by Taylor (op. cit.); (5) the 4th century papyrus fragments of Genesis i, 1–5, published by Grenfell and Hunt in 1900. Our few manuscript traces of the versions, which Symmachus and Theodotion issued toward the end of the 2d century, may be found in the same Hexaplaric fragments that witness to the text of Aquila. Theodotion's Daniel is preserved in the Septuagint manuscripts.

The Septuagint version of the Old Testament is extant in many manuscripts. These represent three textual families,— the Hexaplaric, Hesychian and Lucianic. The Hexaplaric text takes its name from the Hexapla of Origen. This colossal critical work, completed c. A.D. 240, presented in six columns the Hebrew text, the Greek transliteration thereof, Aquila, Symmachus, the Septuagint and Theodotion; and, for certain books, two other Greek translations that are named *Quinta* and *Sexta*. Pamphilus, a disciple of Origen, preserved manuscripts of the Hexapla at Cæsarea. In the 4th century, Pamphilus and his disciple, Eusebius of Cæsarea, reproduced the fifth column,— i.e., Origen's Hexaplaric Septuagint text,— together with all its critical signs. By these critical signs, Origen had marked off passages, which he had found wanting in the Septuagint and had supplied from either Aquila or Theodotion. Unfortunately the scribes were not faithful in handing down the critical signs of Origen. In this wise the Cæsarean text of the Septuagint was evolved into a hopeless commingling of Origen's Septuagint together with his interpolations from Aquila and Theodotion. Meantime two other editions of the Septuagint got a vogue,— those of Hesychius at Alexandria and of Lucian at Antioch. From these three editions of the Septuagint text, all of our extant manuscripts are descended, but by ways that have not yet been accurately traced. The Hexaplaric, Hesychian and Lucianic texts acted and reacted upon each other. The result is that most of the extant manuscripts of the Septuagint contain readings from each of the three textual families. Criticism is at work to trace the respective influences of each text upon the manuscripts now to hand. Consult Field, 'Originis Hexaplorum quæ supersunt, sive veterum interpretum Græcorum in totum Vetus Testamentum fragmenta' (1875).

A. Papyrus Manuscripts.—About 40 papyrus manuscripts of parts of the Septuagint have been found in recent years. Of these the most important are (1) *Oxyrhyncus Pap. 656*, early 3d century, preserving parts of Gen. xiv–xxvii, wherein most of the great vellum manuscripts are defective; (2) *British Museum Pap. 73*, called U, 7th century, Psalms 10–33; (3) a *Leipzig Papyrus*, 4th century, Psalms 29–54; (4) a *Heidelberg Papyrus*, 7th century, Zachary iv, 6 — Malachy iv, 5; (5) a *Berlin Papyrus*, 4th or 5th century, containing some 30 chapters of Genesis.

B. Vellum Uncial Manuscripts.— Parsons ('Vetus Testamentum Græcum cum Variis Lectionibus,' 1798), designated uncial manuscripts of the Septuagint by Roman numerals, minuscule by Arabic. Lagarde inaugurated the now common usage of Roman and Greek capitals for uncials. Von Soden's system of manuscript symbols, though illuminating, has not been widely adopted. The important vellum uncials of the Septuagint text are here subjoined:

Aleph, *Cod. Sinaiticus* (c. 350), 43 leaves at Leipzig, 156 together with New Testament at Petrograd; contains fragments of Genesis and Numbers, I Paral. 9:27 — 19:17, Esdr. 9:9 to end, Esth., Tob., Judith, 1 and 4 Mach., Isa., Jer., Lam. (in part), Joel, Abd.-Mal., the Poetical Books, the entire New Testament, Epistle of Barnabas, and part of 'Shepherd of Hermas.' The text is mixed; in Tobit it widely differs from A and B. Two correctors are of the 7th century. The first writes, at the end of Esther, that he compared the manuscript with a copy of the Hexaplaric text, authenticated by Pamphilus.

A, *Cod. Alexandrinus*, 5th century, in British Museum, complete Bible (excepting Psalms 50:20 — 80:11 and smaller lacunæ); includes deuterocanonical books and fragments, apocryphal 3 and 4 Mach., also 1 and 2 Clement; of Egyptian provenance, and likely Hesychian in text; differs much from B, especially in Judges.

B, *Cod. Vaticanus*, c. 350, in Vatican Library, complete Bible; the Old Testament lacks Gen. i–xlvi, 28, 1 and 2 Mach., parts of 2 Kings ii, Psalms 105–137; the New Testament lacks Hebr. 9:14, 1 and 2 Timothy, Titus, Apoc.; provenance, Lower Egypt; text deemed by Hort to be akin to the Hexaplaric.

C, *Cod. Ephræm*, 5th century palimpsest, in National Library, Paris; 64 leaves of Old Testament, 145 out of 238 leaves of New Testament.

D, *Cotton Genesis*, 5th century, British Museum; fragments of Genesis: almost destroyed by fire in 1731, but previously collated.

E, *Cod. Bodleianus*, 9th or 10th century, Bodleian Library, Oxford, Heptateuch, fragments.

Q, *Cod. Marchalianus*, 6th century, Vatican, Prophets complete; provenance, Egypt; text, Hesychian; marginal notes from Hexapla contain Hexaplaric signs.

Theta, *Cod. Washington*, 5th or 6th century, Smithsonian Institution, Deuteronomy to Joshua.

Among uncial manuscripts of the Septuagint are also listed 17 codices, some of the 5th and 6th century; seven Psalters of the 9th or 10th century; and 18 fragments.

C. Vellum Minuscule Manuscripts.— More than 300 are known but not classified. Few bear witness to the entire Old Testament; the greater part are Psalters. The most critical use of the minuscules of the Septuagint is evidenced by Brooke and McLean, 'The Old Testament in Greek' (Vol. I, *The Octateuch*, 1906–17).

Bibliography.— Swete, 'Introduction to the Old Testament in Greek' (1900), and 'The Old Test. in Greek' (3d ed. of Vols. I and II, 1907; 4th ed. of Vol. III, 1912); Kenyon, 'Our Bible and the Ancient Manuscripts' (1898); Nestle, 'Septuagintastudien' (1886–1907).

2°. New Testament Greek Manuscripts.— According to Von Soden ('Die Schriften des Neuen Testaments in ihrer ältesten erreichbaren

Textgestalt,' 1902), 2,328 Greek New Testament manuscripts are extant; only about 40 contain, either entire or in part, all the books; 1,716 are of the Gospels, 531 of Acts, 628 of the Pauline Epistles, 219 of Apocalypse.

A. Papyrus.—About 31 papyrus fragments, of which six belong to the 3d century, bear most important witness to parts of 12 books of the New Testament. Consult Milligan, 'Greek Papyri' (1912), and 'The New Testament Documents' (1913).

B. Vellum Uncials.— Besides Aleph, A. B. C, already described, there are some 160 vellum uncials of the New Testament; 110 contain the Gospels or a part thereof. The most important of these manuscripts are:

D, *Cod. Bezæ*, 5th or 6th century, Cambridge; Gospels and Acts in Greek and Latin, excepting Acts xxii, 29 to end; text, Western, i.e., that of Old Latin and Old Syriac.

D_2, *Cod. Claromontanus*, 6th century, Nat. Libr., Paris; Pauline Epistles in Greek and Latin, each independent of the other.

E, *Cod. Basileensis*, 8th century; Univ. Libr., Basle, Gospels.

E_2, *Cod. Laudianus*, 6th century, Oxford, in Bodleian Libr., Acts in Greek and Latin, same text as D.

E_3, *Cod. Sangermanensis*, 9th century, Imper. Libr., Petrograd, Pauline Epistles in Greek and Latin, same family as D_2.

F, *Cod. Boreeli*, 9th century, Utrecht, Gospels.

F_2, *Cod. Augiensis*, 9th century, Trinity Col., Cambridge, Pauline Epistles in Greek and Latin, same family as D_2, E_3, G_2.

G, *Cod. Wolfii*, 9th century, Cambridge and London, Gospels.

G_2, *Cod. Bœrnerianus*, 9th century, Dresden, Pauline Epistles in Greek and Latin.

Washington Manuscripts, called W and I by Gregory, giving a 5th or 6th century text of Gospels and Pauline Epistles, Smithsonian Institution.

C. Vellum Minuscules.— The vast number of minuscule witnesses to the New Testament text would seem to indicate a rich field of research for the critic. Such is not the case. Ninety-five per cent of these manuscripts are of little moment; they represent an inferior type of text,— that called the *textus receptus*. Only those minuscules attract attention which approach to one of the great uncials. Thus the "Ferrar Group" resemble the text of D.

Bibliography.— Kenyon, 'Textual Criticism of the New Testament' (1912), and 'Paleography of Greek Papyri' (1899); Warfield, 'Textual Criticism of the New Testament' (1886); Tischendorf, 'Novum Testamentum Græce' (1869), together with Gregory's *Prolegomena* thereto (1894); Gregory, 'Canon and Text of the New Testament' (1907); 'Textkritik des Neuen Testaments' (1909), and 'Die Griechieschen Handschriften des Neuen Testaments' (1908); Von Soden, 'Griechisches Neues Testament' (1913), and 'Die Schriften des New Testaments' (4 vols., 1911–13); Nestle, 'Textual Criticism of the Greek Testament' (1901); Hutton, 'Atlas of Textual Criticism' (1911).

IV. Latin Manuscripts.— Epigraphists find far greater variety of script in Latin than in Greek manuscripts. Hence the former are divided into uncials, semi-uncials, capitals, minuscules and cursives: and these divisions are subdivided. The time, place and even the monastery of the copyist may often be traced by the very distinct script of the text.

1°. *Old Latin Manuscripts.*— The origin of the Old Latin text is wrapped in obscurity. Three distinct types are recognized,— the African, European and Italian. The African text is that used by Tertullian (c. 150–220), and Saint Cyprian (c. 200–258); it is the crudest in style, and apparently the earliest to be made. The European text is less crude in style and vocabulary; and may be an independent translation. The Italian text, probably the *Itala* which Saint Augustine preferred to all others, is the version used by Saint Jerome in his revision. About 40 manuscripts preserve this pre-Hieronymian Latin text,— 27 manuscripts of Gospels, seven manuscripts of Acts, six manuscripts of Paul's Epistles, fragments of Catholic Epistles and Apocalypse. All show the influence of the Vulgate or of corrections made by scribes. The most important Old Latin manuscripts are the bilinguals already noted: D, D_2, E_2, E_3, F_2, G_2. Besides there are the codices *Vercellensis*, 4th century; *Veronensis*, 5th century; *Palatinus*, 5th century; *Brixianus*, 6th century; *Corbeiensis*, 5th century; *Gigas*, 13th century; *Palimpsest de Fleury*, 6th century; *Bobiensis*, 4th century. Cf. Burkitt, 'The Old Latin and the Itala' (1896); Wordsworth, Sanday and White, 'Old Latin Biblical Texts' (1883–97); Buchanan, 'Old Latin Biblical Texts' (1907–11) and 'Sacred Latin Texts' (1912–14).

2°. *Vulgate Manuscripts.*— More than 8,000 manuscripts of the Vulgate are extant, most of which are later than the 12th century and of little use in the reconstruction of the sacred text. Wordsworth and White, in their critical text (1889–1905), collate 40 of the most important Vulgate manuscripts. The Benedictine Commission for the Revision of the Vulgate, established by Pope Pius X, is at work on the collation of this vast store of manuscripts; its task is to reconstruct the various families of the Vulgate text,— the Spanish, Italian, Irish, French, etc.,— to sift out the Old Latin readings and other interpolations, and to reach back as nearly as possible to the text that was issued by Saint Jerome. Chiefest among the Vulgate codices are *Amiatinus*, 8th century; *Cavensis*, 9th century; *Fuldensis*, A.D. 541–546; *Kenanensis*, Book of Kells, 8th century; *Stonyhurstensis*, 7th century.

V. Other Versions.—Syriac manuscripts represent six distinctive Syriac versions of the New Testament. The *Old Syriac* version, made about the middle of the 2d century, is represented by two important manuscripts of the 5th century. The Curetonian Syriac manuscript was discovered in 1842 among manuscripts brought to the British Museum from the monastery of S. Maria Deipara, in the Nitrian Desert, Egypt; and was published by Cureton in 1858. The Sinaitic Syriac manuscript was found by Mrs. Lewis and Mrs. Gibson, in 1892, at the monastery of Saint Catherine, on Mount Sinai. Cf. Bensley, Harris and Burkitt, 'The Four Gospels in Syriac transcribed from the Sinaitic Palimpsest' (1894); Lewis, 'Light on the Four Gospels from the Sinai Palimpsest' (1913);

Burkitt, 'Evangelion da Mepharreshe' (1904).

The *Diatessaron* is a Syriac harmony of the Gospels, made about A.D. 170 by Tatian, an Assyrian and disciple of Saint Justin Martyr. The only manuscript records thereof are two Arabic versions, discovered one in Rome and the other in Egypt, which were published by Ciasca in 1888.

The *Peshitta*, or Syriac Vulgate, was made by Rabbula, A.D. 411–435. The Peshitta Pentateuch, dated A.D. 464, in British Museum, is the earliest dated Biblical manuscript. The Peshitta Gospels number 125, Acts 58, Paul's Epistles, 67; two of these New Testament MSS. are of the 5th century.

The *Philoxenian Syriac* version has reached us only in a manuscript of Apocalypse at Trinity College, Dublin, and in the four minor Catholic Epistles.

The *Harklean Syriac* version is witnessed to by 35 manuscripts dating from the 7th century and later; its text is like to that of D.

The *Palestinian Syriac* version is found in lectionaries and fragmentary manuscripts; these latter date from the 11th century and later.

2°. *Armenian Manuscripts* date from A.D. 887, are very numerous and have not yet been accurately collated.

3°. *Coptic Manuscripts.*— By the time Egypt became Christian, the 3d or 4th century, its ancient language had been evolved into the following dialects: Sahidic, or Theban, of Upper Egypt; Akhmimic, a dialect that was later superseded by Sahidic: Fayûmic, the dialect of Fayûm; Middle Egyptian; Bohairic, or Memphitic, the dialect of Bohaireh,— i.e., of the northwestern province of the Delta. The chief Sahidic manuscripts of the Bible, that have been collated, are among the 58 volumes, discovered (1910) in the Fayûm and now called the Morgan Collection,— six books of the Old Testament and the entire New Testament except the Apocalpyse. The British Museum also has parts of the Old Testament, Acts and Apocalypse. Moreover, the bilingual T, *Cod. Borgianus*, 5th century, in the Vatican, preserves fragments of Mark, Luke and John in both Greek and Sahidic. Bohairic is well represented by manuscripts of the same character as Aleph-B. The *Curson Catena*, dated A.D. 889, is the earliest extant Bohairic manuscript and is in the Parkham Library. Cf. Crum, 'Catalogue of Coptic Manuscripts in the British Museum' (1905); Wallis Budge, 'Coptic Biblical Texts of Upper Egypt' (1912).

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MANUTIUS, mą-nū'shĭ-ŭs, **Aldus** (Ital. Manuzio, Manuzzi and Manucci), Italian printer: b. Sermonetta, near Belletri, in the neighborhood of Rome (and hence sometimes known as Romanus), 1450; d. 6 Feb. 1515. He began his studies at Ferrara, and continued them at Rome where he was tutor to princely families. He learned Greek in Ferrara under Guarini and at the suggestion of the Prince di Carpi established a printing-press at Venice 1489. He gained the reputation of being learned in Greek, Hebrew and Latin and entertained in his house many scholars of the day, forming his "Neacademia" or New Academy, which later was styled "Academia della Fama." He was the author of 'Dictionarium Græcum' (1497); 'Institutiones Græco-Latinæ' (1501–08); 'Grammaticæ Institutiones Græcæ' (1514); 'De Metris Horatianis' (1509). His son PAULUS (b. 12 June 1512; d. 6 April 1574) continued (1533) to manage the printing-press at Venice, and subsequently (1561) presided over the papal press, Typographia Vaticana, at Rome. He wrote a commentary to Cicero's Letters, and 'Epistolæ Selectæ.' ALDUS, the younger son of Paulus (b. 13 Feb. 1547; d. Rome, 28 Oct. 1597), was a scholar and author from his earliest youth. He continued his father's work at Venice and Rome. Consult Renouard, 'Annales de l'Imprimerie des Aldes' (1834); Didot, 'Alde Manuce et l'Hennénisme à Venise' (1873); Goldschmid, 'A Biographical Sketch of the Aldine Press at Venice' (1887); Omont, 'Catalogues des Livres Grecs et Latins, imprimés par Alde Manuce à Venise' (1892). Consult De Vinne, T. L., 'Notable Printers of Italy During the Fifteenth Century' (1910). See ALDINE EDITIONS.

MANX CAT, a breed of house-cats, originating in the Isle of Man, which are characterized by very high hindquarters, and, as a rule, by a very short tail. See CAT.

MANX LITERATURE. The Celtic dialect of the Isle of Man, one of the three subdivision of the Gaelic language, is closely related to the Irish and the Scottish Gaelic, and nearer to the latter than the former. (See CELTIC LANGUAGES; GAELIC LITERATURE). The literature of the language consisted mainly of ballads and carvels (or Christmas carols). The earliest monument of the vernacular is 'The Book of Common Prayer,' translated by Bishop Phillips in 1610 (reprinted in 1895). In later times the orthography closely followed English. In the middle of the 18th century English was a foreign tongue to about two-thirds of the common people, but since that time the decline in the use of Manx has been very rapid, and only two or three thousand of the islanders now speak it. The last edition of the Bible published in Manx was dated 1819, and the last edition of the New Testament was published in 1840. Consult Rhys, 'Outlines of the Phonology of Manx' (1895); Kelly, 'Practical Grammar of Manxs' (1803; reprinted 1859); Goodwin, 'First Lessons in Manx' (1866); Jenner, 'The Manx Language, Its Grammar, Literature and Present State' (Trans. London Philol. Soc. 1875); Moore, 'Surnames and Place Names of the Isle of Man' (1890); 'Folklore of the Isle of Man' (1891); 'Manx Carols' (1891); and History of the Isle of Man' (1900).

MANZANILLO, măn-thä-nēl'yō, Cuba, city, port of entry, in the western part of the province of Santiago de Cuba, on the Gulf of Guacanabo on the southern shore. It has a large harbor which is protected by a number of small islands. The city is the port for Bayamo, an inland city about 40 miles east by north from Manzanillo. The low land and the mangrove swamps around the place make it very unhealthy. It is well built and has a number of fine churches, hospitals and schools,— among the schools four are high schools. Urban pop. about 15,115; municipal 62,845.

MANZANILLO, Mexico, seaport, in the state of Colima, on the Pacific at the entrance to the Bay of Cuyuttan, about 40 miles west of Colima, the capital of the state. A railroad connects Manzanillo and the capital, and the city has steamer connections with the principal ports on the Pacific Coast. In normal times its imports total $1,500,000 annually.

MANZANITA, a popular name for various species of *Arctostaphylos* of the family *Ericaceæ,* especially *A. pungens* and *A. manzanita.* They are shrubs or small trees which sometimes exceed 20 feet in height, and often form impenetrable thickets in the region, Pacific Coast of North America from Oregon southward. They have alternate, evergreen, entire leaves, usually white or pinkish flowers in panicled racemes, and generally smooth berry-like drupes. Another well-known species often called by this name is the bearberry (q.v.), a trailing evergreen shrub which extends from the Arctic region to the mountains of Mexico, whose red berries form one of the principal foods of ptarmigan and other related birds. The great-berried manzanita (*A. glauca*), a California species, bears fruit more than half an inch in diameter. Of the 30 species of the genus, probably a dozen are used for ornamental purposes; some Central American ones in greenhouses where the climate prevents outdoor use; the shrubby western kinds in mild climates; and only the trailing kinds in cold localities. The gnarled roots are an important source of fuel in the untimbered parts of California.

MANZANO, Juan Francisco, hoo-än' frän-thēs'kō män thä'nō, Cuban poet: b. Havana, August 1797; d. there, 1854. A negro slave he wrote and published several volumes of verse before he was manumitted (1837), gaining especial fame by 'Mis treinta Años' (1836), translated into French, German and English, and by 'Apuntes Autobiográficos,' which was never printed in Spanish, but was published in English by Richard Robert Madden in 1840 under the title 'Poems by a Slave in the Island of Cuba recently Liberated.' Manzano's other works include 'Cantos à Lesbia' (1821), several excellent lyrics reprinted in Calcagno's 'Poetas de Color' (1868), and a drama 'Zafira' (1842).

MANZANO MOUNTAINS, a range on the east side of the Rio Grande Valley in Bernalillo, Torrence and Valencia counties southeast of Albuquerque, N. Mex. It extends from Tijeras Canyon on the north to Abo Pass on the south, a distance of 45 miles. The very steep western front of the mountain is granite and schist, capped by a thick sheet of limestone which dips east and constitutes the long sloping plateau of the summit and east side. The highest summits are Manzano Peak, 10,086 feet; Osha Peak, 10,023 feet, and Mosca Peak, 9,723 feet, which are about 5,000 feet above the Rio Grande. To the east is the Estancia Valley, long famous for its salt lakes. Near Bosque Peak is a large spring. The region is forested with yellow pine, pifion and juniper, and is included in the Manzano Forest Reserve. Deer, bear and wild turkeys and many minor wild animals remain in these mountains. Ores of gold, lead and silver are mined on the west slope. Most of the long canyons on the eastern slope contain streams from large springs. The water is utilized by many settlers mostly Mexicans who have occupied the region for several centures. Their small plazas or settlements are Chilili, Tejique, Torreon, Escabrosa, Punta del agua and Manzano. The latter has given name to the mountain, the plaza taking its name from a grove of apple trees (*Manzano* in Spanish) of prehistoric origin. The old ruins of Abo and La Cuara are near the south end of the range.

MANZANOS, män-zä'nōs, a natural park in Lincoln, Bernalillo and Santa Fé counties in New Mexico, southeast of Albuquerque. The Manzano Range, the highest peak of this section, numerous table-lands and valleys, with many springs and small streams, are the chief features of this park. The Rio Grande is on the west side; the base of the mountains is about 1,000 feet above the river and about 11,000 feet above the level of the sea. The almost perpendicular, stupendous red cliffs which rise above the plain and form the western face of the mountains are almost unscalable. South of the red-cliff region is the canyon of Las Moyas, and south of this canyon Bosque Peak, the highest point of the range. Near the summit of the peak is a spring which gushes up in a lake about 50 feet wide.

The view from the summit of the range at some points includes the green valley of the Rio Grande, mountains west of Albuquerque and north to the walls of Sante Fé, and intervening valleys and mountains. On the west of the park, or the western border, are the white Manzano salt lands, on the southeast the gypsum desert. On the level mountain tops are stretches of clearing where the grass grows luxuriantly. Between Hell Canyon and Chilili is a region of immense pine and pifion forest. Some of the animals found here are deer, bear and wild turkey. Grains, vegetables, alfalfa, fruit and other farm products are raised. Sheep, horses and cattle are raised extensively.

MANZONI, män-zō'nē, **Alessandro,** Italian poet and novelist: b. Milan, 7 March 1785; d. there, 22 May 1873. He studied at Milan and Pavia, and published in 1806 his poem on the death of his friend Imbonati, which was followed in 1815 by his 'Sacred Hymns' ('Inni Sacri'). In 1819 appeared his first tragedy, 'Il Conte di Carmagnola,' the first drama in which an Italian defied the unities. This play was reviewed and praised by Goethe, who took a warm interest in every subsequent production of Manzoni. The death of Napoleon inspired one of the finest odes of the century, 'Il Cinque Maggio' ('The Fifth of May'). In 1823 his second tragedy, 'Adelchi,' appeared. This, as well as its predecessor, finds more favor in personal reading than on the stage. After this Manzoni divided his time between country pursuits at his residence in the neighborhood of Milan and the composition of his romance 'I promessi Sposi' ('The Betrothed'), a Milanese story of the 17th century, published in 1827, and which has been translated into most of the European languages (Eng. in Bohn's Library 1883). He strove earnestly to make Tuscan the universal language in Italy. As a poet he outrivaled all his Italian contemporaries. Verdi's 'Manzoni Requiem' is a magnificent musical tribute to his memory. (See BETROTHED, THE). Consult Sauer, 'Alessandro Manzoni' (1872); Stoppani, 'I primi anni A. Manzoni' (1874);

Bersezio, 'A. Manzoni, studio biografico e critico' (1873); Cambu, 'A. Manzoni, reminiscenze' (1885); Waille, 'Le romantisme de Manzoni' (Paris 1890; Eng. trans. by Geddes-Wilkins, Boston 1911).

MAORIS, mä'ō-rĭz or mow'rĭz, native inhabitants of New Zealand, a people of Polynesian race, as is attested not only by ethnological considerations, but by their own legend that they came from Hawaiki (Hawaii or Samoa). Their carefully kept genealogies go back less than a score of generations, so that it seems probable that their coming to New Zealand was four or five centuries ago. Remains of a previous population with Papuan characteristics have been found. The Maoris are well built, with longer bodies and shorter legs than the European type; they have black hair, little whisker on the face, and smooth bodies, wide open, straight black eyes, heads slightly macrocephalic, the index being 77, nose straight and color slightly brown. Their costume, no doubt adopted only upon their coming to a colder country than their early home, was a loose garment, woven from the fibre of *Formium tenax*. Tattooing they brought with them to New Zealand and perfected it. They tattooed the face, decorating in this way the young warrior after his first successful fight, and adding fresh designs for each new exploit. They also knew how to make carvings of great delicacy, and armed themselves with stone weapons. Their religious beliefs were crude, but tinged with animism; they recognized the soul as distinct from the body and surviving it; but connected an enemy's cunning and bravery so closely with his dead body that they ate it, thus to win his warlike virtues, locating intelligence in the brain and courage in the heart. Their worship combined ancestral cult with deification of natural forces and some fetishism. They were divided into tribes, six of these representing the divisions among the original settlers. A warlike people, their chief had absolute power and could pronounce "tapu" or taboo (q.v.) at will. Before the coming of the English they were mostly vegetarian, caught some fish, lived in bark or bough huts and made canoes. Polygamy was practised, and the *arikis* or priest-chieftains acted as physicians, having some knowledge of herbs. Both their numbers and physique have suffered sadly since the introduction of civilization. For the history of the Maoris since British occupation (see NEW ZEALAND, *Government and History*). Consult Cowan, James, 'The Maoris of New Zealand' (in 'Makers of Australasia' Melbourne 1910); Beel, J. N., 'Wilds of Maoriland' (London 1914).

MAP, or MAPES, māps, Walter, English scholar and poet of the 12th century. He was probably a native of Herefordshire. He studied at the University of Paris and became a favorite at the court of Henry II. He attended the Lateran Council of 1179, and was appointed archdeacon of Oxford in 1197. Map is now generally believed to have been probably author, or in large part, author of 'Lancelot' in the Arthurian cycle. It is extremely probable, at any rate, that Map did contribute to the bringing of the cycle into its present state, but it is uncertain to what extent his work has survived. He is undoubtedly the author of a curious book 'De Nugis Curialium,' a notebook of the events of the day and of court gossip. It was edited for the Camden Society in 1850 by Thomas Wright. To Map is attributed the famous drinking-song beginning:

"Meum est propositum in taberna mori"

MAP. The term map is derived from the Latin word "mappa," meaning a napkin. During the Middle Ages the name "mappa mundi," signifying world napkin, was applied to geographical representations of the world on account of the fact that the maps made during that period, at least, were painted on cloth.

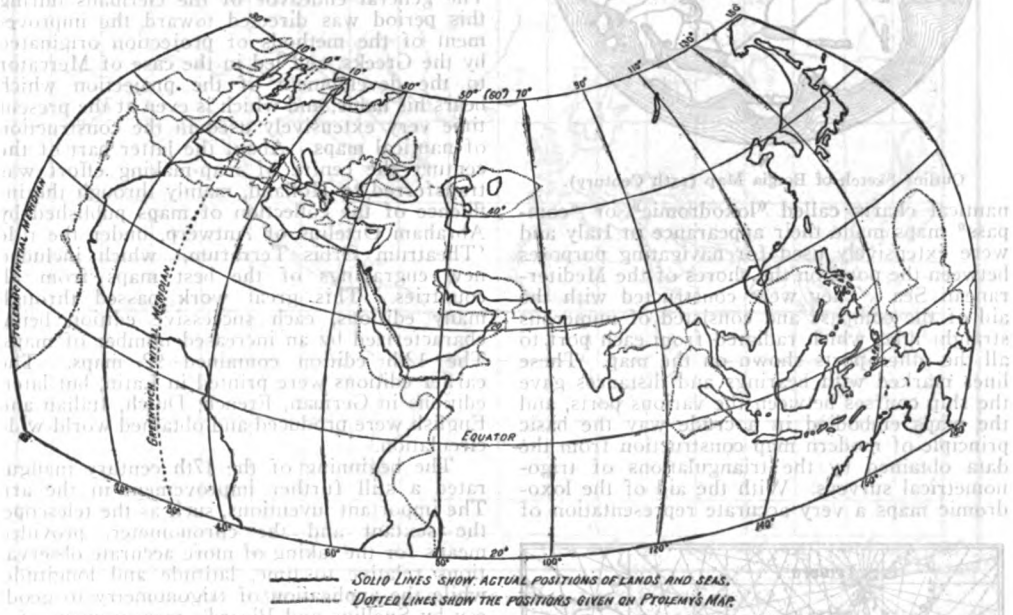
The object of maps and charts is to accurately exhibit to the eye by suitable methods of representation, on a reduced scale, and on a plane surface, the relative position of points, lines and other objects situated on the spherical surface of the earth. As commonly used the term chart is synonymous with map, but the former is usually applied to navigators' maps relating to the sea rather than the land; also to diagrams delineating the positions of the stars in the celestial vault, and to the mapping of hydrographic data; while the term map is almost exclusively applied to representations of the surface of the earth. For example, there are the "star charts" compiled and published by the various observatories, the "maps" of the United States Geological Survey, which represent the land areas, and the "charts" of the United States Coast and Geodetic Survey, which show the depths of the waters along the coast line of the United States.

History.— The earliest maps consisted of simple drawings which merely represented the relative positions of a few known points on the earth's surface and defined in a general way the partly known and partly conjectured limits of the land and water areas. Map-making undoubtedly originated among the wandering tribes of mankind and not among those who inhabited permanent locations such as towns and villages, and were used by those tribes to perpetuate for the benefit of posterity landmarks identifying the regions traveled over by them during their wide excursions to unsettled parts of the world. This is evidenced by the well-known fact that the American Indians and the Eskimo and many of the Polynesian tribes, customary wanderers, are very acute in apprehending the meaning of maps, while the majority of the settled Negro tribes are absolutely lacking in this respect. It is stated that a map drawn by an Eskimo woman enabled Sir Edward Parry to discover Fury and Hecla Strait, while the experience of many pioneer surveyors and topographers, derived from their work through the extensive wildernesses of the American continent, will attest to the general accuracy of elementary Indian charts and of the capacity of those Indians to understand the maps made by others.

Among civilized peoples, the earliest examples of maps recorded are those of the Egyptians. According to Apollonius of Rhodes (230 B.C.) the Egyptians of Colchis, a colony which dated from the time of Rameses II (1340 B.C.), possessed maps engraved on wooden tablets which had been handed down to them from a preceding period. These maps defined with considerable accuracy the known limits of land and water areas and the positions of roads and towns. Other ancient Egyptian maps are the

route maps which were prepared under the direction of King Sesostris, probably during the 12th dynasty; certain old maps in the Alexandrian Library referred to by Strabo and probably collected by Eratosthenes, and the map on papyrus in the museum at Turin, which represents the topographical features of a gold mining district in Nubia. Maps of equal if not greater antiquity are recorded among the ancient Babylonians, who originated the idea of dividing the ecliptic into the 12 signs of the zodiac and also the sexagesimal system of numeration which led to the custom of dividing the circle into 360 degrees of 60 minutes each, with each minute subdivided into 60 seconds, and also to the corresponding divisions of the hour.

Among the Greeks the first map appears to be that of Anaximander about 560 B.C. His work was followed about 100 years later by that of Democritus of Abdera, whose work appears to have been based upon data obtained by himself in his travels, which extended to Persia and perhaps as far as India, and added considerably to the east and west dimensions of the known world areas. These circumstances probably led to the depiction of the world disc in the form of an oval, a distinct departure from the circular form employed by Anaximander and others. About 150 B.C. Hipparchus introduced among the Greeks the Babylonian system of numeration, and discarding the unreliable geographical data of Erastosthenes and others, which were mainly obtained from travelers, suggested the use of only actual astronomical determinations of the latitudes and longitudes of the various points as the true basis for checking distances and directions. His suggestions were practically carried out by Marinus of Tyre, whose work was subsequently corrected by Ptolemy about the 2d century A.D., into a map which is generally considered to be the most complete summary of geographical information prior to the 16th century. In this connection it is well to understand that from the time of Aristotle (384 B.C.) the mathematicians, astronomers and geographers were well aware of the fact that the earth was a sphere and not the flat disc of the Ionic Greeks in the days of Anaximander, the ancient Egyptians and the Babylonians. Therefore, the map-making problem solved by Hipparchus and the successful solution of which formed the foundation for Ptolemy's work involved the devising of a projection by means of which the spherical surface of the earth could be represented on a plane surface. Although Ptolemy is credited with being the father of rational cartography, it does not appear that any maps were actually drawn by him. The oldest editions of the Ptolemaic maps on record appear to be the work of Agathodæmon, a mathematician who lived in the 5th century A.D., and constructed maps accurately based upon Ptolemy's data.

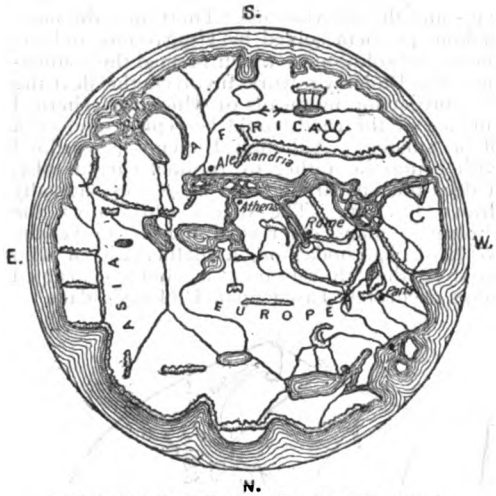

PTOLEMY'S INITIAL MERIDIAN
GREENWICH INITIAL MERIDIAN
EQUATOR
SOLID LINES SHOW ACTUAL POSITIONS OF LANDS AND SEAS.
DOTTED LINES SHOW THE POSITIONS GIVEN ON PTOLEMY'S MAP.

Ptolemy's Map Compared With Actual Positions.

Among the Romans the art of map-making was confined to various kinds of sketch maps valuable for military and political purposes. They did not apply the scientific methods of the Greeks, and although both Cicero and Seneca mention general and topographical maps, and it is a fact that a survey of the whole Roman Empire was made during the reign of Augustus, the grave errors of Ptolemy's maps in all of the Mediterranean countries awaited rectification until the later Middle Ages.

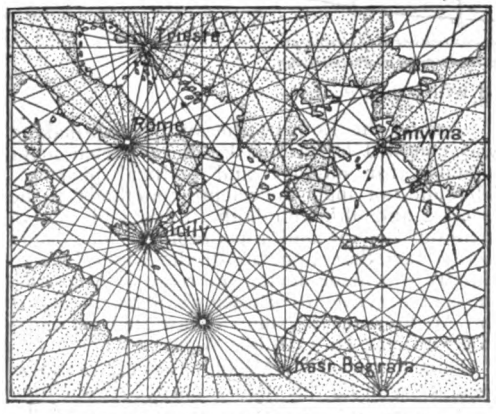
During the earlier Middle Ages cartography, together with all the other branches of scientific culture, took a step backwards. The ban of the Church was laid heavily on the doctrine of the sphericity of the earth and resulted in the resurrection of the ancient Greek idea of a flat circular earth surrounded by an ocean limited by the edge of the celestial vault. In this way the few maps constructed during this period assumed the form shown in the accompanying

figure, and toward the close of the 14th century the entire science of map-making actually fell below the level of that attained by the Ionic Greeks in the days of Anaximander and Democritus. It is a fact worth noting, however, that during the 13th century a form of



Outline Sketch of Borgia Map (15th Century).

nautical charts called "loxodromic" or "compass" maps made their appearance in Italy and were extensively used for navigating purposes between the ports on the shores of the Mediterranean Sea. They were constructed with the aid of the compass and consisted of numerous straight lines which radiated from each port to all the other ports shown on the map. These lines marked with bearings and distances gave the ship courses between the various ports, and the maps embodied in a crude way the basic principle of modern map construction from the data obtained by the triangulations of trigonometrical surveys. With the aid of the loxodromic maps a very accurate representation of



Portion of Loxodromic Map (13th Century).

the coasts of the Mediterranean countries was obtained and served admirably to correct the errors of the Ptolemaic maps which the Renaissance had introduced once more into western Europe.

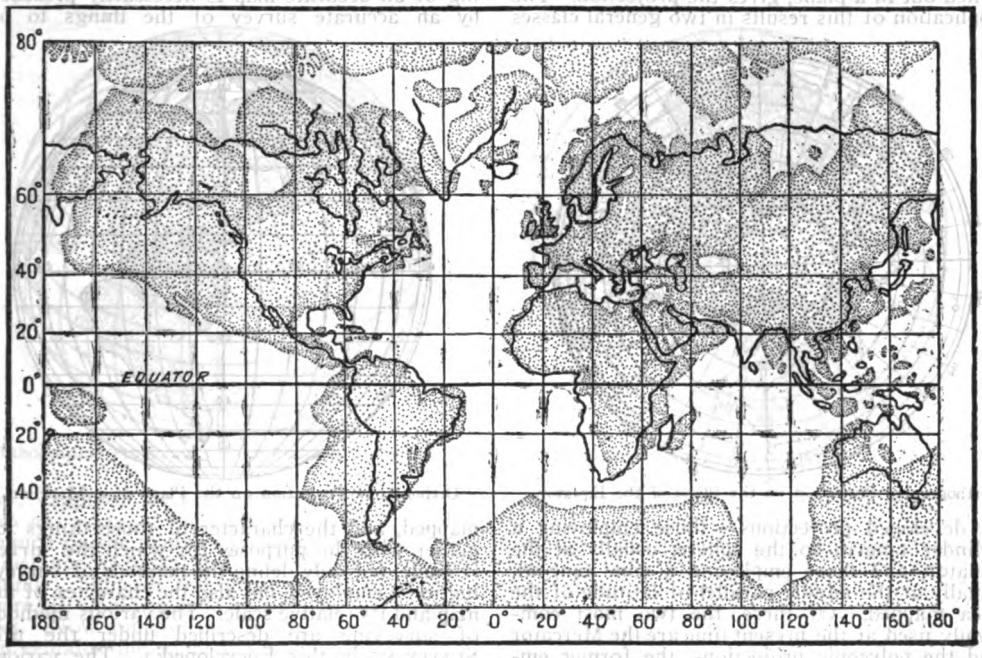
The close of the 15th century witnessed a great revival in the art of map-making, which was materially aided by the newly perfected arts of wood and copper engraving. Furthermore, Purbach, Regiomontanus and others introduced trigonometry, and attempts were made to construct maps based on systematic geographical triangulations. Map-making became a favorite occupation with the Germans, French and Italians, and many valuable editions of maps were produced at Strassburg, Ulm, Basle, Cologne, Paris, Lyons, Vicenza, Venice, Bologna and Rome, representing the work of numerous eminent map-makers, among which those of Joh. Ruysch, Nicolaus Donis and Jacob Angelus de Scarparia were of especial prominence and value.

During the 16th century the number of map-makers increased greatly and brought forward such illustrious cartographers as Johann Werner of Nuremberg, Sebastian Cabot and Gerhard Kramer (more commonly known as Mercator). The general endeavor of the Germans during this period was directed toward the improvement of the methods of projection originated by the Greeks, and led in the case of Mercator to the development of the projection which bears his name, and which is even at the present time very extensively used in the construction of nautical maps. About the latter part of the century the centre of map-making effort was transferred to Holland, mainly through the influence of the collection of maps published by Abraham Ortelius of Antwerp, under the title 'Theatrum Orbis Terrarum,' which included new engravings of the best maps from all countries. This great work passed through many editions, each successive edition being characterized by an increased number of maps. The 12th edition contained 92 maps. The earlier editions were printed in Latin, but later, editions in German, French, Dutch, Italian and English were produced and obtained world-wide circulation.

The beginning of the 17th century inaugurated a still further improvement in the art. The important inventions, such as the telescope, the sextant and the chronometer, provided means for the taking of more accurate observations relative to time, latitude and longitude, while the application of trigonometry to geodesy by Snellius and Picard's measurement of a degree of the meridian between Paris and Amiens introduced more precise methods of computation. Some of the most important productions of this epoch are those of Johann Baptist Homann of Nuremberg, and the work of Nicolas Sanson, Guill de l'Isle and Jean Baptiste Bourignon d'Anville and other eminent geographers of France working under the royal patronage, and 'Dowets Atlas' published in England under the patronage of the Duke of Argyle.

These important works carry the art of map-making through a period of over 200 years and bring it to a point where instead of being treated as a matter of private business enterprise it was taken up as a governmental matter, and the original surveys, together with the maps based thereon, were executed at the cost of the state. The first step in this direction was taken by France, the object being the production of a series of maps for military purposes and as a cadastre for the land tax. For this purpose the entire country was covered with a network of

triangles connecting numerous stations, the positions of which were astronomically determined. The maps constructed from the data thus obtained far surpassed in the correctness of detail all those of earlier date. The example set by France has been followed by all of the first-class nations of the world, and by some of lesser importance. In Europe practically the whole continent, with the exception of the Balkan States, have been surveyed and mapped at the expense of the governments of the various countries. Outside of Europe, the principal large areas covered by surveys based on exact triangulations are the United States, a part of the Dominion of Canada, the whole of British India, a portion of Asiatic Russia and small portions of Australia, South Africa, the Dutch East Indies and Algeria.



SOLID LINES SHOW ACTUAL POSITIONS OF LAND AND WATER AREAS.
DOTTED AREAS SHOW THE POSITIONS ACCORDING TO MERCATOR'S MAP OF 1569.
Mercator's Map Compared With Actual Positions.

The science and art of modern map-construction may be considered most conveniently and usefully under three headings — theoretical projections, practical methods of construction and duplication of reproduction.

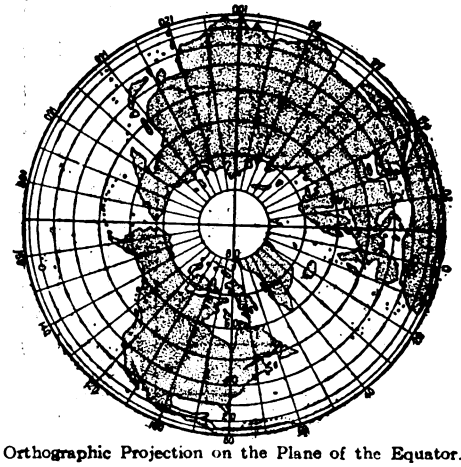
Theoretical Projections.— Since the object of maps and charts is to accurately represent by suitable symbols on a plane surface the relative position of objects, etc., on the spherical surface of the earth, the problem requiring solution is one that is geometrically impossible, and therefore any map, no matter how accurately constructed, must necessarily be only an approximation to the truth. Yet by the assumption of certain lines of reference which correspond to the actual latitudes and longitudes on the surface of the earth according to certain assumed or fixed geometric laws, the approximation to the truth may be so nearly attained as to be quite as useful as the truth itself for all practical purposes. Such a system of lines of reference constitutes a projection by means of which any point or line on the surface of the sphere may be plotted on the map from its known co-ordinates, or from which the co-ordinates of any plotted point may be ascertained.

There are two general classes of such projections — the "true" or "perspective" projections which depend upon the actual position of the spectator's eye, and the "developed" projections in which the eye is assumed at the centre of the sphere, or else occupies an arbitrary position.

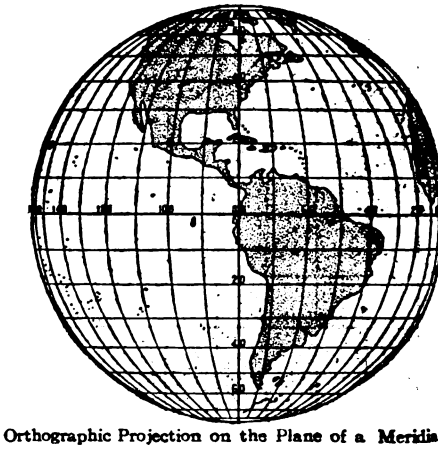
Perspective Projections are of three kinds: (1) the "orthographic," with the eye supposed at an infinite distance, and the plane of projection perpendicular to the line of sight; (2) the "stereographic," with the eye supposed upon the surface of the sphere and occupying the pole of a great circle, the plane of which is the plane of projection, and (3) the "gnomonic" or "central" projection, with the eye assumed at the centre of the sphere and the plane of projection tangent to its surface. To this class belongs also the globular or equidistant projection designed to avoid to a certain extent the contraction of the orthographic and the exaggeration of the stereographic projections near their respective outer edges. In this projection the eye is supposed at a distance of $\sqrt{\frac{1}{2}}$ times the radius above the surface of the sphere. The perspective projections, in their astronomical and geographical application, are generally used for representing large areas and hemispheres and are seldom used in the construction of maps of small extent on large scales, in which case they are too laborious of construc-

tion and cannot be made to satisfy any special conditions not included within the scope of their inherent characteristics. The three principal perspective projections were known to the ancients, the orthographic and the stereographic being accredited to Hipparchus and the gnomonic to Thales. The globular projection was devised by Nicolisi. They served to introduce projection methods, but with the exception of the gnomonic, which is still used for the construction of star charts and some classes of nautical charts, they have been superseded in the construction of modern maps by the developed projections.

Developed Projections are obtained by the substitution of a cylindrical or a conical surface for the ordinary plane of projection, and that surface, being subsequently developed or rolled out in a plane, gives the projection. The application of this results in two general classes



Orthographic Projection on the Plane of the Equator.



Orthographic Projection on the Plane of a Meridian.

of developed projections — those employing a cylinder tangent to the sphere, usually at the equator, and those employing a cone tangent, usually at the middle parallel of latitude of the area mapped. Of these, the two most commonly used at the present time are the Mercator and the polyconic projections, the former employing a tangent cylinder and the latter an infinite number of tangent cones. The Mercator was purposely designed for the use of nautical maps and is principally employed for that purpose at the present time. On a map based on this projection the loxodromic curve, that is, the course of a vessel which intersects the successive meridians at a constant angle, is represented on the map as a straight line, thus facilitating the plotting of that course from day to day during the progress of the voyage, and materially assisting in determining the true distance and bearing of the objective point. The polyconic projection appears to have been devised for the purpose of providing a suitable base for the mapping of the Atlantic coast line of the United States by the United States Coast and Geodetic Survey. The direction of this coast line being nearly diagonal to the meridians and parallels, and having a great north and south amplitude, required for its representation a projection which avoided the inherent distortions of the various conic projections due to the great obliquity of the intersections of the meridians and the parallels in the higher latitudes. This projection on account of the close similarity of the figures on the surface of the earth to the corresponding figures on the projection, and the uniformity of scale over the whole map is now extensively used for mapping not only areas of comparatively limited extent, but also for the representation of continental areas of large extent.

For the mathematical operations involved in the computation of the elements of these projections and for illustrations showing how they are plotted in the actual construction of maps, see article under the title PROJECTION in this Encyclopedia.

Practical Methods of Construction.—As a rule, and with but a few exceptions, the drawing of an accurate map is necessarily preceded by an accurate survey of the things to be mapped, and the character of those things together with the purposes for which the survey is made, not only define the methods of surveying to be employed, but also the character of the map and its relative scale. The various methods of surveying are described under the title SURVEYING in this Encyclopedia. The various kinds of maps may be grouped into the following named general classes: "Geographical," "physiographical," "topographical" and "geological" maps. The representations of astronomical, hydrographical, nautical and statistical data belong more properly to the category of charts. The various forms of railroad maps are merely diagrams only useful for consultation with the accompanying railroad schedules. The amount of distortion required to fit them for the purposes for which they are used makes them entirely unreliable for any other purpose. The military maps are of various types and differ greatly according to the purposes for which they are used. Staff maps usually show every feature, natural and artificial, on the surface of the country mapped in the minutest detail and with the greatest accuracy. The differences of elevation of the various points are a matter of the greatest moment, and, therefore, are usually treated in the most complete manner both as to graphic effect and accuracy of information. The sketch maps are much simpler

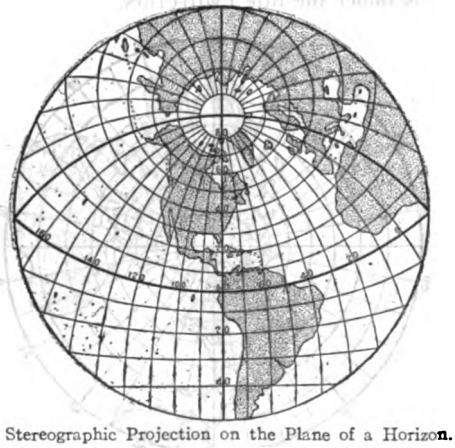
in character and represent in the most elementary way the most important features which have a direct bearing on the particular kind of military operations involved.

In the construction of original maps the principal points to be considered are the "scale," the "projection," the "topographical representation" and the method of "duplication or reproduction" for publication.

Scale.— The scale will depend upon the character of the survey and the data obtained thereby; the extent of the area to be represented on the map, and the process by which the map is to be reproduced. The original map should always be drawn on a scale sufficiently large to allow the draughtsman to plat the field notes easily and accurately. The difference between a large scale and a small scale and their relative effect on maps may be explained as follows: Suppose the fractional scale of a map is given as $\frac{1}{63360}$ it indicates that an interval of one inch on the map is equivalent to an interval or distance of 63,360 inches or one mile on the ground. Suppose the map to be 10 inches square, it would include an area of 100 square miles. Now suppose that while the size of the map remains the same the scale is reduced to $\frac{1}{633600}$, it would then include an area of 10,000 square miles. Any map scale which requires that the platting of measurements be made by the use of a scale with finer divisions than one-hundredths of an inch is about the minimum limit for platting original work, although measurements requiring an accuracy of one two-hundredths of an inch are commonly made in the construction of accurate projections for the mapping of exact trigonometrical surveys. The scale should be made larger directly in proportion to the increase in the amount of details to be shown on the map. The scale for maps in railroad work should always be large — 1 inch to 1, 2 or 300 feet. For the platting of plane table and other triangulations, and for work requiring the filling in of a great amount of topographical detail, the scale should not be less than one inch to one mile. All surveys such as the townships and sections of the Public Land Surveys, in which the measurements are made by chain or by stadia, should not be platted on a scale less than 1 inch to 40 chains or half a mile.

In all cases the original maps may be subsequently reduced to any desired scale by hand, by pantagraph or by photographic methods. Reduction by pantagraph is satisfactory and useful only for the roughest classes of work. Photographic reductions of maps of limited size and prepared as copies for engravings may be made with fair accuracy and very slight distortion. Map sheets exceeding 15 to 20 inches square in the size of the final reduction cannot be reduced photographically with sufficient accuracy to satisfy the demands of absolutely accurate copper, steel and stone engravings. For such engravings the reductions should always be made by hand. The method of hand reduction usually employed is the simple but effective one of dividing the original and the copy into a system of equivalent squares and then drawing in all the details by hand. The very simplicity of the method demands the services of the most skilful and experienced draughtsmen, so that the resulting maps possess a far greater accuracy than any reductions that may be obtained by photo-mechanical methods. There are examples of hand-made maps in the office of the United States Coast and Geodetic Survey which are actually superior in accuracy, execution and beauty to the prints from the very fine copper engravings for which they served as a copy.

Orthographic Projection on the Plane of a Horizon.

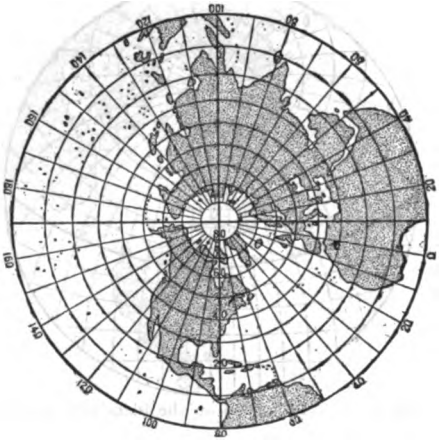


Stereographic Projection on the Plane of a Horizon.

If the maps are to be reproduced by being engraved on copper, steel or stone the reductions furnished the engravers should always be upon the "final scale" or scale of publication. This is also applicable to wax engravings when photographic methods of reduction are not available to the engraver. When the maps represent a great diversity of physical characteristics it is convenient to avoid confusion of details by using various conventional colors so as to distinguish the land from the water areas, the rivers and creeks from the roads, railroads, contour lines, etc. If the maps are to be reproduced by any of the photo-mechanical processes such as photo-engraving, photo-lithography or the half-tone process, the use of colors should be strictly avoided, and the map made in black and white on a scale that will allow about one-third reduction to the scale of publication.

Projection.— At the present time the construction of the basic projection for a map is a very simple matter and consists merely in the laying off of the proper tabular values which have been computed for the use of map draughtsmen. The most useful tables of this kind in this country are those published by the United States Coast and Geodetic Survey and the Hydrographic Office of the Navy Department. The Mercator and the polyconic are the two principal projections employed at the present time, but many others are often employed where their special characteristics satisfy the particular requirements of the maps. It is in such cases that an intimate knowledge of the various projections is valuable to the map-maker.

For information relative to the particular characteristics of the various projections see article under the title PROJECTION.



Stereographic Projection on the Plane of the Equator.

Stereographic Projection on the Plane of a Meridian.

Topographical Representation.— The differences of elevation between the various points on the surface of any region, that is, the hills, mountains and valley formations together with other natural features such as the river systems, plains, tablelands, etc., constitute the topography of that region. The term "orography" is applied to the aspect furnished by those natural features the existence of which are due solely to differences of elevation — the valleys, hills and mountains. These are represented on maps either by a system of horizontal lines drawn at right angles to the slopes called "contours," or by a system of vertical lines called hachures which follow the directions of the slopes and are drawn at right angles to the "contours." The best idea of the nature of contours may be had by supposing a dam built across a river and flooding the country above it. Suppose the height of the dam to be increased at uniform intervals of 10 feet. At each increase in the height of the dam the water will reach a new level, and the irregular horizontal line where it intersects the surface of the ground is the contour for that particular height of the dam and connects all the points of the same elevation on the surface of the whole region. In the actual determination of contours the datum, zero or point of beginning of the vertical intervals is the level of the sea, and the value of an interval adopted — 10, 20, 50 or more feet — depends upon the purpose for which the survey is made, and the scale of the final map. In surveys for hydraulic purposes such as the construction of dams and reservoirs, the laying of water and sewer systems and the digging of canals, many cases occur which require the adoption of a contour interval as small as one or two feet. In such cases the areas surveyed are small and are mapped on a large scale. On the other hand, when the areas are large with great differences of elevation, larger contour intervals are adopted, and the maps are made on a small scale. The maps of the United States Geological Survey are among the best examples of orographic delineation by the method of contours, for detailed information of which see article under the title GEOLOGICAL SURVEY.

The delineation of orographical features on the more accurate and useful classes of maps by the method of hachures is now being rapidly supplanted by that of contours. The only practical value of the former lies in its pictorial effect, and that, when viewed from the standpoint of usefulness, fails to compensate for the enormous expenditure of labor and time in the execution of the maps and the subsequent engravings. The most beautiful examples of this class of maps in the world are those that have been published from time to time by the United States Coast and Geodetic Survey, but even in the work of that bureau the method of hachures is being slowly supplanted by the method of contours.

Duplication or Reproduction.— Maps are duplicated or reproduced for publication by being engraved by hand on copper, steel, stone, wood and wax. Wood and steel engravings are very rarely made at the present time, wax engraving being the most common process. Maps are also reproduced quite extensively by the photo-engraving and photo-lithographic processes. The finest classes of engraved maps, like those of the United States Coast and Geodotic Survey, are impression prints taken directly from the engraved plate by means of hand presses. In this bureau the engravings are made exclusively on copper plates. The maps of the United States Geological Survey, which

represent the finest class of lithographed maps in this or any other country, are engraved on stone, from which impression prints are taken on hand presses and transferred to smooth stones from which the final prints are made on power-driven cylinder presses. A great many of the maps which make up the best classes of atlases published for scientific and other purposes in foreign countries are reproduced in the same manner.

For detailed information relative to the various processes enumerated, see articles under the titles ENGRAVINGS, LITHOGRAPHY, PHOTO-ENGRAVING, etc.

Consult Craig, 'A Treatise on Projections' (United States Coast and Geodetic Survey, Washington 1882); Gelcich and Sauter, 'Kartenkunde geschichtlich dargestellt' (Stuttgart 1897); Gretschel, 'Lehrbuch der Kartenprojektion' (Weimar 1873); Verner, 'Map Reading and Elementary Field Sketching' (London 1893); Zondervan, 'Allgemeine Kartenkunde' (Leipzig 1901); West, 'The Elements of Military Topography' (London 1894); Woodward, 'Geographical Tables' (Washington 1894); Steinhauser, 'Grundzüge der Mathematischen Geographie und Landkartenprojektion' (3d ed., Vienna 1887); Fiorini, 'Le Projezioni delle carte Geografiche' (Bologna 1881); Cebrian and Los Arcos, 'Teoria General de las Proyecciones Geográficas' (Madrid 1895); Tissot, 'Mémoire sur la Représentation des Surfaces et les Projections des Cartes Géographiques' (Paris 1881).

MAPES, māps, **Victor**, American playwright: b. New York, 10 March 1870. He was graduated from Columbia in 1891, was Paris correspondent of the New York *Sun* 1892–96 and dramatic critic of the New York *World* 1898–99. He has written 'Duse and the French' (1897); and among plays by him may be named 'A Flower of Yeddo' (1898); 'The Tory's Guest' (1900); 'Don Cæsar's Return' (1901); 'The Detective' (1908); 'The New Henrietta' (1913); 'The Lasso' (1917).

MAPLE, a genus (*Acer*) of trees, together with a few shrubs of the family *Aceraceæ*. The species, of which there are about 100, are indigenous to the north temperate zone, being best represented in China, Japan, United States and Canada. They are characterized by opposite, palmate or lobed, exstipulate leaves; small polygamo-dioecious flowers in axillary corymbs or racemes; and compound, one- or two-seeded, long-winged nuts (samaras). The maples constitute one of the most widely useful genera of trees, being extensively employed for ornamental and street planting and for windbreaks, while the wood serves well for tool-handles, furniture, flooring and many other purposes. As fuel, they are especially valuable, being considered superior to almost all other woods except hickory. Because of their popularity for ornamental planting a great number of horticultural varieties have been produced, especially in Japan, and nearly all, but particularly the Japanese and American species and varieties, are noted for their brilliant autumnal colorings, which in the various shades of yellow and red are unequaled by any other group of northern trees. The flowers are rich in nectar and are sought by bees. Most of the species thrive best upon rich moist land suitable for agricultural purposes and are considered an indication of the type of soil. A few grow in wet land, and many upon mountain sides. They are readily propagated by means of seeds which, in the case of the early maturing kinds, should be sown as soon as ripe, the later ones in autumn or spring, being stratified in sand during the winter. Some choice varieties are grafted or budded and others may be increased by cuttings and layers.

In America, the best known, most widely planted and otherwise most important species is probably the rock or sugar maple (*A. saccharum*), a stately round-headed, gray-barked tree, often attaining heights of 120 feet. It is especially characteristic of rich woods from Maine to Michigan and southward in the mountains to Georgia, everywhere being noted for the rich colors of its leaves in autumn. Besides great popularity for all the purposes mentioned above, some of the trees are highly prized for their wavy-grained wood, which, being of satiny appearance and capable of high polish, is used under the name of curly maple often as veneers for choice furniture. It is further the most important of the species which yield a saccharine sap, and is a chief source of maple syrup and sugar, to obtain which the trees are "tapped," the sap caught in buckets and evaporated. A yield of three pounds per tree annually is considered very profitable; six pounds or even more is often obtained from many specimens whose sap is either especially abundant or particularly rich in sugar. If properly done no injury results to the trees. A form of the sugar maple, the black maple (*A. saccharinum* var. *nigrum*), so called from its very dark bark, is considered a distinct species (*A. nigrum*) by some botanists. It has the same range and habitats as the preceding and in nearly every respect the same uses, including sugar production. This form is more abundant than the preceding in the Central States.

The silver maple (*A. saccharinum*) is a widely spreading tree which attains a height of 120 feet throughout the same range as the above species. Being very ornamental in form and particularly also because of its graceful leaves, which are silvery white beneath, this tree is widely planted where rapid growth and quick effects are desired. Its chief fault is its brittleness; it quickly succumbs to high winds. It will succeed upon a wide variety of soils. Its sap, though rather sweet, is less useful for sugar than the above-mentioned species.

The red, scarlet or swamp maple (*A. rubrum*) attains heights similar to the above, has about the same range, but is most frequently found in wet ground. It is named from the brilliant color of its flowers, which are borne profusely in early spring before the leaves appear and from its red fruits which appear soon after. Being of good habit it is widely planted for ornamental purposes upon all kinds of soils. Its wood is used for most of the purposes enumerated above.

The Norway maple (*A. platanoides*) is somewhat smaller than the preceding species, being more compact and umbrageous. It is widely planted in private grounds and in parks, but is less valuable for street planting than the above because of its shorter trunk. It is a native of Europe. The sycamore maple (*A.*

pseudo-platanus), another European species, is smaller still, attaining only about 70 feet. It is also widely planted in America as well as in Europe, being a vigorous, rapid grower and succeeding upon a great variety of soils. The common maple (*A. campestre*) occasionally attains 50 feet, but is usually a smaller tree or even a shrub. It is of European origin and is widely planted.

The Japanese maple (*A. japonicum, A. palmatum* and other species) are small trees or shrubs which because of the great diversity of form of their leaves and their dainty habit have become widely popular in the parks and gardens of the United States and Europe. Their exceptionally brilliant autumnal coloring is taken advantage of in Japan where in the fall they approach the chrysanthemum in popularity.

The maples furnish food for a large number of insects, some of which live upon the green parts and others upon the wood. Several species of scale insects (q.v.) are often abundant enough to do considerable damage. The cottony maple scale (*Pulvinaria innumerabilis*), *Pseudococcus aceris*, a European insect, and the "gloomy" scale (*Aspidiotus tenebricosus*), a southern species, are among the most troublesome. Several caterpillars live upon the leaves, the forest tent caterpillar (*Malacosoma disstria*), the fall web-worm (*Hyphantria cunea*), and the larvæ of the tussock moth (*Orgyia leucostigma*), being the most generally important. The maple worm (*Anisota rubicunda*) is frequently very destructive. It is the larva of a moth. Of the borers, the larvæ of *Dicerca divericata* and *Glycobius speciosus*, which are beetles in the adult state, and those of *Ægeria acerni*, a clear-winged moth, are among the best known. The second beetle mentioned is known as the sugar maple borer. Consult Bailey, 'Standard Cyclopædia of Horticulture' (New York).

MAPLE SUGAR INDUSTRY, a trade term, in common use, pertaining to the manufacture of sugar and syrup from the sap of rock or sugar maple, *Acer saccharinum*. This production is classed under "Agriculture" by the United States Census Bureau, and note was made of its importance at a very early day in the history of the government. The product is strictly confined to North America and the greater part to more or less limited areas in each of the geographical divisions known as New England, Middle Atlantic and Central-Western States, and Canada bordering on the North. Twenty-three States reported maple sugar or syrup in 1900. Of the 11,928,770 pounds of sugar made that year in the United States, 87.8 per cent, or 10,478,240, were produced in the North Atlantic States. The three States of Vermont, New York and Pennsylvania reported over 80 per cent of the total. On the other hand, the States of the North Central division were credited, in 1900, with 1,211,334 gallons of syrup, out of a total of 2,056,611 for the entire country. Since 1900 the production has steadily declined, and what is marketed is subject to so much adulteration with ordinary sugar that the real output is unobtainable. It is, however, a decadent industry, as the trees have largely been exterminated.

In Canada the manufacture of maple sugar and syrup assumed a relatively high importance compared with the production in the United States. The Dominion census of 1901 gives the entire volume as 17,762,636 pounds (syrup being reduced to equivalent pounds of sugar for the purposes of this enumeration); and, of this aggregate, the province of Quebec is credited with 13,643,672 pounds of maple sugar, the province of Ontario following with a production of 3,791,598 pounds. Maple sugar is reported from other provinces and territories as follows: New Brunswick, 207,450 pounds; Nova Scotia, 112,496 pounds; others light.

History.— Maple sugar and syrup was made at an early day by the pioneers of New England and Canada. It may have been a product of "necessity, the mother of invention," or an inheritance from the Indians, who had a spring-date of *sugar-making moon;* but, in either event, the first methods employed were crude, and the article was dark in color and not attractive. Moreover, tapping trees with an axe tended to denude the forest of its maples, and the whole modus operandi was wasteful in the extreme. The sap was caught in troughs, hewed out of logs, thence carried in pails to the boiling place and reduced to syrup in potash kettles. These kettles of the 18th century, or earlier, would be a curiosity at this day. They were suspended by chains from a horizontal pole, supported by forked or crossed sticks at each end, and surrounded by a blazing open fire. The camp-kettle, captured from General Burgoyne at the battle of Saratoga, 17 Oct. 1777, preserved in the Bennington Battle Monument, is a fine illustration of what these kettles resembled. Primitive ways, however, did not long continue. Improved methods, both as to tapping the maples,— leading up to the use of metal spouts,— and refining sap, followed one another, until now modern scientific principles prevail; and it is possible to reduce the sap to sugar or syrup, using evaporators, almost immediately, so that its color is nearly white, flavored only with the delightful aroma of the maple.

Production and Adulteration.— The supply in the United States, being much below the demand, has led to the "manufacture" of an article of commerce in which the pure maple product plays a very inconsequential part. Good authorities assert that sugar refineries make much more sugar and syrup, labeling it "maple," than the entire natural production; that the refuse sugar of the real maple enters into the artificial combination of glucose, cane or beet sugar, and chemicals — to a very large degree creating a ready market for black American and Canadian sugars and the "late runs" of the maple sugar-producing sections of both countries.

MAPLESON, mā'pl-sŏn, **James Henry**, English operatic impresario: b. London, 4 May 1830; d. there, 14 Nov. 1901. He was educated at the Royal Academy of Music, London, and went to Italy for vocal instruction, but was compelled to abandon his career as a singer, owing to throat trouble. He then entered an orchestra, playing the viola, and in 1861 he became manager of the Lyceum Theatre. In 1862 he assumed the management of Her Majesty's Theatre where he made himself famous. In 1871, after the burning of Her Majesty's Theatre he managed Drury Lane but returned to the new Her Majesty's upon its completion.

In 1878 he conducted the tour of an Italian opera in America and subsequently made tours with the greatest singers of the day, including Patti, Nilsson, etc.

MAPPA, Adam Gerard, Holland-American soldier and pioneer type founder: b. Delft, Holland, date unknown; d. Olden Barneveld, N. Y., April 1828. As a young man he entered the military service of his native country, gaining "marked distinction as a brave and enterprising officer." About the time of his marriage (1780) he left the Dutch service and engaged in the business of type founding. This business was interrupted by political storms which disturbed the province of Holland in 1786–87. Colonel Mappa again took up the sword and became "one of the leaders of the Dutch Patriots, being commander of the armed citizens in the Province of Holland." "After keeping The Hague in a state of alarm with his small band of patriots alone, he was overwhelmed with numbers." And on 9 Oct. 1787 he was obliged to disband his men. With 14 others he was banished forever from Delft.

At the request of his republican friends he went to the court of Versailles to solicit countenance and co-operation. But Louis XVI had troubles enough of his own, and as the prospects of the civil liberty being established in his own country grew fainter, Colonel Mappa decided to move with his family to America. On 1 Dec. 1789 they arrived in New York. The time between his expulsion from Holland and his landing in America was spent with other Dutch political refugees at the Chateau de Watte near Saint Omer.

While in Paris, Colonel Mappa became acquainted with Thomas Jefferson, then American Ambassador to France, who advised him to take to America a type-founding plant, there being then no such industry on the western side of the Atlantic. Accordingly Colonel Mappa brought with him a complete "letter foundry" embodying not only the "Western but Oriental languages" as well. The outfit was valued at something like £3,500 New York currency. Up to this time all printers had been obliged to purchase their type in England or Scotland. The following January (1790) Francis Adrian van der Kemp, a fellow refugee, wrote to his friend, John Adams, then a political power and later President, suggesting that the Congress impose a tax on all foreign type to encourage and protect Mappa's infant industry.

Where he set up his type foundry at first it is perhaps impossible to say. A New York directory of 1792 makes mention of him as doing business at 22 Greenwich street. The infant industry was not prosperous as letters from Mrs. Mappa to her friends plainly indicate. So on 1 Feb. 1794 he advertised his "type manufactory for sale." In the following summer, 1794, Colonel Mappa moved to Olden Barneveld, later Trenton, now Barneveld, and became the resident agent for the Holland Land Company, for more than 30 years until the time of his death. Here he built the stone mansion which still stands unharmed for the years and which in his day was often the gathering place of noted pioneer families of central New York.

MAPU, mä'pö, **Abraham,** Hebrew novelist: b. Kovno, 1808; d. 1867. At an early age he became noted as a Talmudist. He studied Latin and the classics of that language exerted a lasting influence on his literary endeavors. He was also well acquainted with French literature and in 1848 was appointed professor in a Jewish school at Kovno. From this time dates his devotion to Hebrew literature. In 1852 appeared his novel 'Ahabat Zéyon' (Love of Zion), the forerunner of the romance movement in 19th century Hebrew literature. It became very popular although orthodox rabbis assailed it as a profanation of the Leshon Quodesh or Holy Tongue. In 1865 Mapu published another historical novel, 'The Transgression of Samaria.' In 1887 an English translation entitled 'Amnon, Prince and Peasant' was published by F. Jaffe. Other works of Mapu are 'The Hypocrite' (1859–69); Hebrew manual; Hebrew grammar, and a Hebrew textbook for the study of French. Consult Slouschz, N., 'The Renaiscence of Hebrew Literature' (1909).

MAPURITO, mä-poo-rē'tō, one of the Mexican white-backed skunks. See SKUNK.

MAQUI, mä'kē, an evergreen shrub of the family *Elæocarpaceæ,* found in Chile, from the juice of whose acid fruit the Chileans make a wine given to persons ill with a fever. Its wood is employed in making musical instruments and its bark furnishes strings for them. It is the best-known species of the genus *Aristotelia* (*A. maqui*), and is cultivated as an ornamental shrub in Europe.

MAQUOKETA, mą-kō'kē-tą, Iowa, city, county-seat of Jackson County, on the Maquoketa River and on the Chicago, Milwaukee and Saint Paul and the Chicago and Northwestern railroad, about 42 miles north of Davenport. It is in an agricultural section; valuable limestone quarries are in the vicinity and not far distant are forests which furnish excellent hardwood timber. Its chief manufactures are flour, lime, woolen goods, brick, tile, foundry and machine-shop products and wooden-ware. It has an extensive trade in manufactured articles, farm products and livestock. It has county buildings, several churches and schools and the Boardman Library Institute. There are two semi-weekly newspapers and good banking facilities. The city owns and operates the waterworks. Pop. 4,776.

MARA, mä'rą, in old Runic, a goblin that seized on men asleep in their beds and took from them all speech and motion. In Russian it was called *kiki-mora,* or ghosts. In Hindu mythology Mara is the ruling spirit of evil; the tempter mentioned by Edwin Arnold in his 'Light of Asia.' Mara is also frequently identified with the incubus and with nightmare (qq.v.)

MARABOU, măr-ą-boo', a large African pink-white pouched stork (*Leptoptilus crumenifer*), which resembles the adjutant (q.v.) of India in appearance and habits. It gives its name to the soft and drooping feathers (coverts) which cover the root of the tail and are prized for millinery and other ornamental purposes; a large part of the "Marabou feathers" sold, however, are derived from the Indian adjutant.

MARABOUTS, măr'ą-boots, **MARABOOTS,** or **MARABUTS,** Mohammedan Arab hermits or devotees, leading a secluded religious life or occupying a religious station in northern Africa. They have great influence among the Berbers and distribute amulets, affect to work miracles and are thought by their followers to exercise the gift of prophecy. Throughout the Barbary States the tombs of the Marabouts are conspicuous objects, being generally built in the open country and regarded by the people with much reverence. Some of them have degenerated into religious tramps.

MARACAIBO, mä-rä-kī'bō, Venezuela, capital of the state of Zulia, situated on the strait that connects Lake Maracaibo with the Gulf of Venezuela. It has a large and safe harbor, and maintains commercial relations with foreign markets, with the interior and with Colombia. The Red "D" Line Steamship Company, of New York, sends a vessel on regular trips to Maracaibo and hundreds of small craft, suitable for shallow waters, carry on the trade of the coast and rivers tributary to the lake. This city is also the starting point for passenger and freight steamers and the railway lines of sections of the state of Los Andes. The most important buildings are the Executive Mansion, the public market, Legislative Palace, municipal building, Baralt Theatre, university, six churches and the new jail. There are five hotels, two clubs, 24 restaurants, etc. The public plazas contain statues of the patriot, Gen. Rafael Urdaneta, and Don Rafael Baralt, author of a history of Venezuela, who was born in Maracaibo and became a member of the Royal Spanish Acadamy. There is a dockyard for the construction of sailing-vessels and the city has electric lighting, telegraph and telephone service, submarine cable, street railways, etc. Coffee, cocoa and hides are the chief exports, which have an average annual value of $2,300,000. Maracaibo, at first called Nueva Zamora, was founded in 1571 by Alonzo de Pacheco. Pop. about 50,000.

MARACAIBO, Gulf of. See VENEZUELA, GULF OF.

MARACAIBO, Lake of, Venezuela, in the northwestern part, connected with the Gulf of Venezuela by a strait about 50 miles long and from 8 to 15 miles wide. The lake lies between 9° and 11° S. lat. and 71° and 72° W. long., and is about 100 miles long from north to south and 80 miles across the widest part. At the mouth it is about 500 feet deep, but at its head it is shallow and the land near the shore is marshy. Large vessels cannot enter because of a bar at its mouth which leaves only from 8 to 13 feet of water. A number of rivers flow into the lake and keep it fresh, but when strong north winds prevail it becomes brackish. The tides do not affect the lake to any very great extent although it is a marine inlet. It was once much larger than at present, as the shore-marks indicate, but the basin has been filled in, leaving this one large lake and a number of smaller lakes which are connected by creeks. See VENEZUELA.

MARAJO, mä-rä-zhō' (called also Joannes), Brazil, an island at or between the deltas that form the mouths of the Amazon and Para rivers; area, about 14,000 square miles. From east to west the greatest dimension is 162 miles and 110 miles north and south. The greater part is low; in the centre are several lakes. In the north and west are swamp lands and in the east and south forests, the rubber tree predominating. The chief settlement is Saure on the eastern coast. There are not many residents, as in the rainy season nearly the whole island is flooded. Cattle raising and gathering rubber are the chief occupations.

MARAL, the red deer of Persia.

MARANHAM, mä-rän-yäń, or **MARANHÃO,** Brazil, a maritime state, just south of the Equator, bounded on the north by the Atlantic Ocean; area, 177,566 square miles. The surface is uneven, but there is no range of mountains. There are numerous rivers flowing into the Atlantic, large forests, extensive plains where cattle are reared; the climate is fine and the soil fertile. The Paranhyba is the principal river, being 700 miles long, with several large tributaries. The Gurupy, the Mearim and the Itapicurú are each about 500 miles in length. Agriculture has only begun; the emancipation of the slaves, on whose labor the state had depended, was followed by a period of great depression. Cotton, sugar and rubber are the principal products. Coffee, rice, corn, cacao and tropical fruits grow luxuriantly. The population is not great enough to properly develop the rich natural resources, there being only 2.8 persons to the square mile. Efforts are being made to colonize different sections, but the hot climate is not attractive. The present inhabitants are chiefly of Portuguese descent; but there are about 20,000 Indians and a few hundred negroes and mulattoes. The capital is Maranham. Pop. about 683,645.

MARANHAM, or SÃO LUIZ DE MARANHÃO, säń loo-ēzh' dō mä-rän-yäń', Brazil, capital of the state of Maranham, on an island on the bay of São Marcos and between the mouths of the Itapicurú and Mearim rivers. The first settlements were made by the French in 1612. The ground is low and the climate warm but the place is healthful. The harbor, once good, is filling with sand, and little or nothing is done for its improvement. It has considerable trade, the imports and exports totaling $600,000 annually. The chief exports are cotton, sugar, hides, rubber, cotton-seed and the skins of goats. Wool is woven and rugs and felt manufactured. The chief imports are machinery and clothing. The city has many fine buildings, public and private. Pop. including the suburbs, about 45,000.

MARANHÃO. See MARANHAM.

MARASCHINO, măr-ăs-kē'nō, or **MARASQUINO,** a fine liqueur prepared from the sour cherry of southern Europe (*Prunus mahaleb*). The best-known kinds come from Dalmatia and from Corsica. There are other brands that use the name.

MARASMUS, a vague term denoting general emaciation or atrophy with no special cause apparent; now used in relation to the wasting of infants due to malnutrition combined with unhygienic surroundings. See CHILDREN, DISEASES OF.

MARAT, Jean Paul, zhŏń pōl mä-rä, French revolutionist: b. Boudry, Neuchâtel, Switzerland, 24 may 1744; d. Paris, 13 July 1793. He

studied medicine in Paris, traveled widely and practised in London and later in Paris. The first breath of the Revolution converted the industrious doctor into an audacious fanatic and demagogue. He succeeded, by his violence and energy, in commanding attention. Danton instituted the club of the Cordeliers and collected around him all the fiercest spirits; among the number, Marat, who became the editor of the *Publiciste Parisien*, better known under its later title *L'Ami du Peuple*, again changed to the *Journal de la Republique Française*. This sheet was the oracle of the mob. Denounced to the Constitutional Assembly and proceeded against by the municipal authorities of Paris, he contrived to escape to London and was later in hiding in Paris. During the existence of the Legislative Assembly he continued his outrages, figured among the actors of 10 August and in the assassination of September (1792). He was a member of the Committee of Public Safety to the convention and made the Ministers, General Dumouriez and the Girondists, the objects of his attack. Being charged in the convention with demanding in his journal 270,000 heads, he openly boasted of that demand and declared that he should call for many more if those were not yielded to him. The establishment of the revolutionary tribunal and of the committee for arresting the suspected was adopted on his motions. On the approach of 31 May, as president of the Jacobin Club, he signed an address instigating the people to an insurrection and to massacre all traitors. Even the Mountain party denounced this measure and Marat was delivered over to the revolutionary tribunal, which acquitted him; the people received him in triumph, covered him with civic wreaths and conducted him to the hall of the convention. His bloody career was closed by assassination. (See CORDAY D'ARMANS, CHARLOTTE). His remains were placed in the Pantheon, whence they were later removed. Consult Chevremont, 'Jean Paul Marat' (1881); Bat, 'Jean Paul Marat, the People's Friend' (1901); Velay, C., 'Correspondance de Marat' (Paris 1908).

MARATHI. See MAHRATTAS.

MARATHI LANGUAGE AND LITERATURE. Marathi is one of the principal vernaculars spoken in India. It bears a close affinity to Sindhi and Gujerati and is spoken by about 20,000,000 people. There are several dialects of it, named, respectively, Konkani and Dakhani. The latter is the standard dialect and circulates in the Deccan, the former in the coast region of the Mahrattas and shows a large admixture of Dravidian, while in the district around Goa (a Portuguese possession) it also contains many Portuguese expressions and phrases. Besides, Marathi as a whole has a rather strong infusion of both Arabic and Persian words. All the same, modern Marathi has departed less from the original Sanskrit than most other Prakrits, being a direct descendant from the Maharastri of the Middle Ages. A stock of its vocables are taken from Sanskrit itself, the so-called *tatsamas*. There are three genders in Marathi, the only one of the Prakrits that has retained this feature of Sanskrit. Konkani literature was destroyed by the Portuguese inquisition.

Marathi literature is abundant. It took its inception with Namdev in the 13th century, who wrote descriptive and didactic poems of a religious cast. Tukaram, the most famous of Marathi writers (A.D. 1609), published writings showing Vishnuic convictions. Mayur Pandit in the 18th century also wrote many poems, epic, lyrical and descriptive. Marathi lends itself most readily to rhyme, and there are current among the Marathi people many rhymed proverbs, both pithy and fanciful. In prose not much of consequence has been produced, but of late, under English influences, much prose has been written by the Marathi in English, as well as in their own vernacular, but all of it is rather commonplace. The Marathis employ the Devânagari alphabet, the same as in Sanskrit.

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MARATHON, măr'ą-thŏn, Greece, an ancient village in Attica, about 20 miles northeast of Athens. It was situated on a plain which extends for about six miles along the sea shore, with a breadth of from one and a half to three miles. The site of the ancient village was not probably that of the present Marathona, but at a place now called Vrana, a little farther south. Through the centre of the plain runs a small brook. Here was fought the great battle between the Athenians and Persians, 490 B.C. (See MILTIADES). A tumulus or «soros» on the plain marks the burial-place of the Athenians who died in battle. It was excavated by the Greek Archæological Society in 1890-91, and yielded many interesting relics.

MARATTI, mă-rät'tē, or **MARATTA,** mă-rät'tā, **Carlo,** Italian painter and engraver: b. Camerino, 13 May 1625; d. Rome, 15 Dec. 1713. While a child he amused himself with painting all sorts of figures drawn by himself on the walls of his father's house. In his 11th year he went to Rome, studied the works of Raphael, of the Caracci and of Guido Reni in the school of Sacchi, and formed himself on their manner. His Madonnas were particularly admired. Louis XIV employed him to paint his celebrated picture of Daphne. Clement IX, whose portrait he painted, appointed him overseer of the Vatican Gallery. We are much indebted to him for the preservation of the works of Raphael in the Vatican and of the Caracci in the Farnese Palace. He also erected monuments to those masters in the church Della Rotonda. As an artist Maratti deserves the title given him by Richardson, of the «Last Painter of the Roman School.»

MARATTIALES. See FERNS AND FERN-ALLIES.

MARAVEDI, măr-ą-vā'di, the lowest denomination of old Spanish copper coins in use

from 1474 to 1848, varying in value from one-seventh to one-third of a cent. There were also, at an earlier period, maravedis of gold weighing 60 grains.

MARBEAU, Jean Baptiste Firmin, zhŏñ bä-tēst fēr-măñ mär-bō, French philanthropist, founder of the day nursery: b. Brives, 18 May 1798; d. Saint Cloud, 10 Oct. 1875. He practised law in Paris, and in 1841, being deputed to inspect the charitable institutions of the first arrondissement of the city, planned the crèche or day nursery for the care of children of working mothers. The first crèche was opened 14 Nov. 1844 at Chaillot; a Société des Crèches was founded in 1846; and his plan was described in his book, 'Des Crèches' (1845). Marbeau played a less prominent part in other charities and wrote on various problems of pauperism. Consult the 'Life' by Roussel (1876).

MARBLE, mär'bl, **Manton,** American journalist: b. Worcester, Mass., 16 Nov. 1834; d. Maidstone, England, 24 July 1917. He was educated at the Albany Academy and the University of Rochester, being graduated from the latter in 1855. After spending seven years in the employ of Boston and New York newspapers he bought the New York *World,* on the staff of which he had been employed from 1858 to 1860. Marble was engaged in a controversy with President Lincoln concerning the publication of certain dispatches in the *World.* The latter journal was temporarily suspended from publication. Marble was one of the first to recognize and give publicity to the writings of Herbert Spencer. In 1885 President Cleveland sent Marble to the British, French and German governments as special envoy to discuss the subject of international bimetallism. On his return, after conferences with various European authorities, he advised the President that upon the co-operation of the United Kingdom, for which neither Tory nor Liberal leaders were prepared, depended the German and French resumption of free bimetallic coinage, and advised that United States purchase of silver should cease. Marble was one of the founders of the Manhattan Club and at one time the president of that organization. He belonged also to many literary and scientific societies, among them the Century Association, the Round Table, the Cobden Club and Metropolitan Club. He was the author of 'Letter to Abraham Lincoln,' 'The Presidential Counts,' 'A Secret Chapter of Political History' and a memoir of Alex. G. Mercer, which prefaced his 'Notes of an Outlook on Life.'

MARBLE (from the Greek *marmairein,* to sparkle), a compact rock which, in its pure form, is composed entirely of carbonate of lime or limestone. In its best form it is a variety of calcite, the tiny crystal facets sparkling and flashing in the sun's rays; hence its ancient name. It is seldom found in perfect purity, the tractable qualities of the limestone allowing the introduction of many foreign substances during its formation. Thus there will be seen marble with streaks of various colors running through it, caused by the action of oxide of iron or other chemicals. Almost any limestone rock is commonly called marble, even certain varieties of granite, onyx, porphyry and rock largely composed of gneiss and mica-schist. True marble is a metamorphic equivalent of limestone, from which it has been produced by heat or pressure, or both.

Marble has been a favorite stone for forming into statuary and for decorative work in buildings and monuments, from the very earliest ages. The Greeks, who were the first to endow this lifeless stone with marvelous genius in their statuary and bas-reliefs, were blessed with an almost inexhaustible supply of the very finest and purest marble yet discovered, on the island of Paros, in the Ægean Sea. This marble, so celebrated as "Parian," possesses a peculiar waxy attribute which gave the statues formed from it a beautiful polish. The 'Venus de Medici' was made from this stone, which is almost perfectly white. The Parthenon was built of marble of Pentelicus, which was a little more finely grained. The marbles of Carrara, were even then known but not generally put in use till later years, being still among the finest marble in the world, though having some gray streaks.

In many other parts of Continental Europe and in Great Britain are quarries of fairly pure marble. America has a large supply of this useful stone. Each year new occurrences of it are found in the Rocky Mountains, some of them pure white, others with variegated colorings. Perhaps the finest example of these wonderful marbles of the Rockies is found in the new State capitol building of Colorado, at Denver. In the eastern part of the United States there are many quarries of marble which have been in use for many years. Vermont is probably the seat of the largest quarries. Little of this marble is finely grained and white enough to answer for the sculptor's use, but it is admirably adapted for ornamental purposes in architecture and for monuments for the dead. American sculptors still generally use the marbles from Carrara, though the merits of the American product are becoming known. Vermont, although one of the smallest States in the Union, exports more stone for commercial purposes than any other State, except one, Pennsylvania standing first. The money value in 1903 of Vermont's stone product was in excess of $6,000,000, a large part of it being in marbles of various grades.

The quarrying of marble is now carried on extensively, the use of machinery largely taking the place of the ancient hand methods. Fifty years ago the quarries of Rutland, Vt., still the largest in the world, were operated by ox teams and hand work of the crudest form. To-day, these vast quarries have an extensive outfit of electric cranes and derricks, which move the blocks of marble in any desired direction, easily and quickly, one of these traveling cranes having a carrying capacity for 100,000 pounds. The stone is too easily broken to permit the use of blasting powders of any kind. This method is used in some of the Italian quarries, but causes great waste of material and is most unsatisfactory. In the Vermont quarries, a machine called a "channeler" has been found the best for economical work and has been exclusively adopted. It consists of a row of long chisels set in a strong, traveling framework. This gang of chisels vibrate up and down, cutting a channel in any direction desired in the face of the marble ledge. The channel can be made any reasonable depth, according to the size of block desired. When this channel, or groove, is suf-

ficiently long and deep, the machine is reversed and cross channels are cut and the bottom perforated. Then wedges are carefully driven in behind the block of stone and it gently falls over, to be lifted by a crane to the railroad cars or to that part of the quarry devoted to further treatment of the output. As a rule, the stone is sent in its rough state to the purchaser, who dresses it himself. When the order is for monument work or some special design in architecture, the marble is treated at or near the quarry. In thus further treating the product, a toothless saw, or gang of saws, is used. The block of stone is placed on a horse, or platform, and the saws set at work, the size of the cut being gauged by setting the saws close together, or far apart, as needed. A stream of water in which is mixed sea sand or other sharp, hard sand, falls upon each saw. The friction of the iron blade, aided by the sand and water, quickly cuts up the marble into any desired shape. Some marble cutters use saws of wire, but the best seem to be those made of strips of soft iron one-sixteenth of an inch thick and, when new, four inches wide. The marble wears down one of the saw blades very rapidly. When the blocks are thus sawn into the requisite shapes by the power gang-saws, they are then placed on tables and ground down to size, a small piece of marble being rotated over them by hand or power, water flowing over the surface being ground. With surprising facility, the marble yields to this treatment. Polish, in the final stages, is given by rubbing with wood or other soft material, and finally cloth. Much hand work is, of course, necessary with the mallet and chisel and polisher, but all the rough, heavy work, which formerly made marble so costly and hard to obtain, is now done entirely by electric and steam power. One of the finishing rooms at the Rutland works, located at Proctor, Vt., is 1,000 feet long and contains scores of giant gang saws, cutting up the marble into various shapes. This one plant, the largest in the world, has an output of $3,000,000 annually and employs hundreds of men. Most of this output is of white marble, though brown, gray, green and other shades are found in profusion.

One ancient method of mining this delicate stone, still used entirely by the Mexicans in mining onyx, is to drill holes in a line, insert plugs of some porous wood, pour in water and allow the wood to swell. This gently forces the precious stone free, without the least injury.

One quality of marble, not usually recalled, is its ability to withstand great heat safely. In the devastating fire in 1903 at Paterson, N. J., buildings built of granite crumbled and perished. Those of marble still stand, almost as good as ever. Its use is, therefore, becoming more and more general in erecting fireproof buildings in the large cities, the floors and often the entire inside wall and ceiling being overlaid with it.

Some really fine examples of craftsmanship in this line are found in the public buildings of New York City and elsewhere in America, notably the new buildings of the Hall of Records and the Appellate Division of the Supreme Court, in New York. In the making of monuments for the dead, marble is most extensively used. The floors of bathrooms, tops of toilet tables, basins for washing hands and clothes, tiling of various sorts — all these and a thousand other household purposes find in marble their chief exponent. Probably more than $25,000,000 worth of finished marble products are used in the United States annually, made from domestic quarries entirely. See also ROCKS.

MARBLE FAUN, The. The 'Marble Faun' was begun by Nathaniel Hawthorne during his visit to Italy in 1858 and was published in 1860. In England it was issued as the 'Transformation.' The scene is laid in Rome, but two of the four chief characters are Americans. The most interesting person in the story, however, is Donatello, a young Italian of noble birth who bears a strong resemblance to the statue of a faun by Praxiteles, and who, according to a tradition in his family, numbered a faun among his early progenitors. There are two women characters, of different types. Miriam is of a rich, full-blooded nature, and her past is bound up with some terrible mystery. Hilda, who is said to have been drawn with the writer's daughter in mind, was evidently intended as an example of the pure and self-contained New England maiden, but she has been aptly characterized by one critic as an "admirable little icicle." The romance is a study of the effects of a great guilt on these persons, and especially on Donatello, in whom it brings about the change referred to in the English title of the book. Hawthorne here seems to be considering the great question of the mission of sin in the world, but in the end the explanation which he allows one of the characters to suggest he makes Hilda reject with horror. The romance has serious technical defects. It contains an excess of traveler's descriptions, which, however excellent in themselves, have little to do with the story; and it fails to satisfy the curiosity which the author persistently arouses regarding Miriam's past. Dissatisfaction with the ending was so great that in a later edition the author added a chapter of explanation, which, however, he justly regarded as no improvement. The chief merits of the book lie in the conception of Donatello, in the elusive symbolism and suggestiveness which characterize all Hawthorne's best work, and in several impressive scenes. Some of these, like the meeting with the model in the catacombs and the visit to the church of the Capuchins where the murdered monk lies, have a more dramatic quality than is usual with Hawthorne.

WILLIAM B. CAIRNS.

MARBLED GODWIT. See GODWITS.

MARBLED TIGER-CAT. See TIGER-CAT.

MARBLEHEAD, mär'bl-hĕd, Mass., town, in Essex County, on Massachusetts Bay and on the Boston and Maine Railroad, 18 miles northeast of Boston. The town is on a peninsula which has Massachusetts Bay on the east and south and Salem harbor on the north, and includes the villages of Marblehead, the "Neck," Clifton and Devereaux. It was settled by immigrants from Guernsey and Jersey in 1629, and was a part of Salem until 1649. Its good harbor gave it advantages for fishing and for coast trade that made it for a time the second settlement in importance in the colony, Salem being the first. The leading industry is shoemaking,

and seed-growing is carried on, but the town is famous as a yachting resort, for its boat-building and the excellent fishing grounds. Whittier immortalized the place in one of his poems. Judge Story and Elbridge Gerry were born here. It is a port of entry. The old form of town meeting government prevails. There are excellent municipal waterworks, banks and a newspaper. There are still, in a good state of preservation, a number of pre-Revolutionary buildings. The town has three well-kept parks, and Abbott Hall, which contains the town library, art gallery and records. Consult Agge, 'Sketches of Marblehead'; Roads, 'The History and Traditions of Marblehead.' Pop. about 7,500.

MARBLES AND MARBLE PLAYING. Marbles are small balls of baked clay, marble, agate or spheres of glass, used as toys and playthings for children. They are manufactured in large quantities in Saxony for exportation to the United States and to India and China. They were also largely manufactured in the agate mills at Oberstein on the Nahe, in Germany, for the American market. The material used in Saxony is a hard calcareous stone, which is first broken up into square blocks with a hammer. These are then thrown 100 to 150 together into a mill, which is a stationary flat slab of stone, with a number of concentric furrows upon its face. Over this a block of oak of the same diameter, partially resting upon the small stones, is kept rotating, while water flows upon the stone slab. In 15 minutes the marbles are worn completely round and are fit for sale. An establishment with three mills will manufacture 60,000 marbles in a week. Agates are made into marbles at Oberstein by first chipping the pieces nearly round with a hammer and then wearing them down upon the face of large grindstones.

The game of marbles is variously played; usually with a circular ring marked on the ground, the player taking one marble between the thumb and forefinger and dexterously shooting at other marbles within the circle, striking them with sufficient force to throw them outside the limits of the ring. This form is called ringtaw, and the marbles placed in the ring are apt to be clay ones, called "commys," which is probably short for "commons." A larger and better grade of marble is used for the "shooter." When a player misses a shot, it is then the turn of his opponent. Sometimes he also loses his turn when he drives his shooter outside of the ring. Play is often for "keeps," each boy winning what he knocks out. Another game of marbles is called "nine holes," though it may be played with a less number of holes. A row of small cup-shaped depressions are made in the ground, and the object is to toss or bowl one's marble into each hole in succession, the one accomplishing it with the fewest plays winning. Very likely golf had its fundamental idea in this simple game of marbles. In a variant form the boys shoot at other marbles to knock them into the holes, but their own shooter must not follow, under forfeit, suggesting the basic principle of the game of pool. "Hit and span" is another game much played. One player tosses his marble to a distance, and the other player tosses his marble as close to it as he can; if he hits it, it is keeps; if he comes within a handsbreadth or span he makes a hit and scores one. Then they reverse, and his opponent tries, the one making the most hits or points winning. This game can be played in walking along a country road, and appears to have been invented by boys who wanted to play on their way to school. In some games of marbles it is fair to toss or bowl the shooter; and in others the player must touch the large knuckle of his forefinger to the ground when shooting, and this the boys call "knuckling down fairly." These games are subject to infinite change, according to the whim of the boys of a locality who play them. They make their own rules and pass them along to the smaller boys as they grow up. Girls seldom play marbles and adults are not supposed to play at all. Marbles can be played indoors in bad weather, one way being for the players to sit on a carpet, with their legs apart, so as to stop the rolling marbles; one places a marble between his feet and the other player shoots at it.

MARBLING, *in bookbinding,* the process of coloring paper or the edges of books, in imitation of the veining of variegated marble. In the case of a book, after the volume is formed, but before the cover is put on, the book leaves are trimmed and tied between two boards and taken to a trough or vessel, perhaps two inches deep, which is filled with clean gum water. Various colored pigments, ground in spirits of wine and mixed with a small quantity of oxgall, are thrown upon the surface of the gum water, and disposed in various forms with a quill and comb, forming a variegated, marble-like pattern. When satisfied with the coloring mixture, the workman dips the edges of the book into the trough, and the colors adhere. Cold water is then dashed over the edges, to set the colors and bring them out clearly. Sometimes single leaves are marbled and placed just within the book cover, front and back, for ornamentation. Marbling was formerly quite common, but is now seldom used, solid colors, as red edges, being preferred, or gold edges. The deckle-edged book cannot be marbled, owing to its rough edges. See BOOKBINDING.

MARBURG, mär'boorg, Austria, a town in Styria, 38 miles south of Gratz, on the left bank of the Drave and on the Southern Railways, whose repair shops are a leading industry. Quantities of lumber, grain, wine and poultry are shipped. There are also shoe factories, cement works, flour mills and machine shops. Pop. about 23,000.

MARBURG, Prussia, a town of Hesse-Nassau, on the slopes of an acclivity above the Lahn, 46 miles north of Frankfort. It dates from the 12th century. The principal buildings are the castles of the landgraves of Hesse, now partly used as a prison; the 13th century church of Saint Elizabeth; the town house and the celebrated Marburg University, founded in 1527, and having, in 1914, 118 professors and 2,049 students, and a library of 275,000 volumes. Here Luther and Zwingli debated on transubstantiation in 1529. It became a part of a Prussian province in 1866. The town has manufactures of machinery, leather, carpets, tobacco, pottery and toys. Pop. about 22,000.

MARBURY v. MADISON, a well-known decision in law handed down in 1803 by the United States Supreme Court. It is important as affording the earliest instance of the decla-

ration by the court that a Congressional statute is null and void by reason of its repugnance to the Constitution of the United States. Marbury was appointed justice of the peace in the District of Columbia by President Adams, but the commission, though drawn up, signed and sealed, had never been delivered. Madison, when he became Secretary of State, refused to deliver it. An act of Congress empowered the United States Supreme Court to issue to executive officers a writ of mandamus to force them to attend to their duties, and on the basis of this act Marbury brought suit. Now the Constitution nowhere mentions the right to issue a writ of mandamus among the cases of original jurisdiction by the Supreme Court. Chief Justice Marshall therefore decided against Marbury, and his argument, admittedly the only accurate one, established an important precedent which is found only in the courts of the United States.

MARCABRUN, mär'kä-brėn, a French troubadour: b. in Gascony, about 1140; d. toward the end of the 12th century. He was a special favorite at the court of Alfonso VIII of Castile, where he seems to have been the chief of the royal troubadours. He was an extensive writer of love songs of which quite a number have survived to the present and have been printed.

MARCASITE, *in mineralogy,* an iron disulphide (FeS_2), differing from pyrites in that it crystallizes in the orthorhombic system. It was formerly known as white pyrites, cellular pyrites, cockscomb pyrites, hepatic pyrites or leberkies, etc. It is usually a pale yellow, being thus lighter than true pyrites, but it has gray to brown-black streaks. When arsenic is present it is known as kyrosite. It is often found in clays, but is far less common than iron pyrites.

MARCEL, Etienne, ā-tē-ĕn mär-sĕl, French political leader: b. Paris, 31 July 1358. From December 1355 he was provost of the Paris merchants and actual ruler of the city. He put to death two officials of the Crown and finally persuaded the Dauphin Charles to act as regent while King John was held by the English. Not finding the Dauphin properly submissive, he obtained assistance from Charles the Bad of Navarre. He was killed during an uprising of the more wealthy and conservative citizens against his power. Consult Lazard, 'Un Bourgeois de Paris au XIVth Siècle' (1890).

MARCELINE, mär'sĕ-lēn', Mo., city, of Linn County, on the Atchison, Topeka and Santa Fé Railroad, 105 miles northeast of Kansas City. The neighboring region is rich in coal, oil and natural gas. The city has extensive coal and oil interests, railroad repair shops and artificial stone works. The electric-lighting plant and water-supply system are the property of the municipality. Pop. 3,920.

MARCELLINUS, mär-sĕ-lī'nŭs, **Saint:** d. probably 25 Oct. 304. He was a pope who succeeded Caius in 296. The Donatists alleged that during the Diocletian persecution he sacrificed to idols. He was, however, vindicated by Augustine from this charge.

MARCELLUS, mär-sĕl'ŭs, **Marcus Claudius,** Roman general: b. before 268 B.C.; d. near Venusia, 208 B.C. In *222* being consul with Scipio he twice defeated the Insubrians in northern Italy, and with his own hand killed their king, thus winning the *spolia opima.* After the disaster of Cannæ in the Second Punic War (216), Marcellus took command, gained several slight victories over the Carthaginians and hence was named "the sword of Rome," Fabius Cunctator being called "the shield of Rome." His third consulship (214) was spent in Sicily, where he attacked Syracuse, and after a two years' siege prolonged by the skill of Archimedes captured the city. In his fifth consulate after two years of varying success against Hannibal in Italy he was killed in a skirmish near Venusia.

MARCELLUS I, Saint, Pope: d. 310. He succeeded Marcellinus and did not take office until 308. The Emperor Maxentius banished him from Rome for excommunicating an apostate and according to some authorities forced him to serve as a slave on the public highway. He suffered martyrdom under Maxentius.

MARCELLUS II (MARCELLO CERVINI, märchĕl'lo chĕr-vē'nē), Pope: b. in Tuscany, 6 May 1501; d. Rome, 6 May 1555. He was cardinal legate at Trent of Julius III, whom he succeeded in the pontifical chair. Although originally opposed to polyphonic music, he at once withdrew his opposition to it after listening to Palestrina's famous 'Missa Papæ Marcelli.' His pontificate lasted only 22 days.

MARCELLUS STAGE, *in geology,* a term introduced by the New York State Geological Survey for the thin rock, mostly shale, which is the lowest group of the Upper Devonian System, and which is most typically seen in New York State at the little village of Marcellus, whence the stage is named.

MARCH, Alden, American surgeon: b. Sutton, Mass., 1795; d. 1869. He was educated at Boston and at Brown University, receiving the degree of M.D. from the latter in 1820. From 1825 to 1831 he was a professor in the Vermont Academy of Medicine, from 1831 to 1833 at the Albany Medical Seminary, and in 1833–34 at the Albany Medical School. In the latter year he founded a school of practical anatomy in Albany and in 1839 founded the Albany Medical College, in which he was professor of surgery from the foundation until his death in 1869. Dr. March also founded the Albany City Hospital; was president of the New York State Medical Society in 1857 and founded the American Medical Association. Dr. March invented several surgical appliances and improved others. He published 'Wounds of the Abdomen and Larynx' (1854), and numerous papers in medical journals.

MARCH, Francis Andrew, American philologist: b. Millbury, Mass., 25 Oct. 1825; d. 1911. He was graduated from Amherst in 1845, studied law in New York in 1849–50, was admitted to the bar in 1850, in 1856 became adjunct professor of *belles-lettres* and English literature in Lafayette College (Easton, Pa.), and in 1857 professor there of the English language and comparative philology. In 1873–74 and 1895–96 he was president of the American Philological Association, in 1876–1903 of the Spelling Reform Association and in 1891–93 of the Modern Language Association. He was among the earliest advocates of a historical study of the English language and of a philological study of the classic works of that lan-

guage. His contributions to the transactions and proceedings of the American Philological Association and other learned societies have been very extensive. He was a consulting editor of the 'Standard Dictionary,' and decided many spellings and forms for that work. He also edited the Douglass series of Christian Greek and Latin classics (1874–76), was director of the American readers for the great 'Historical Dictionary of English' of the London Philological Society, and published 'A Method of Philological Study of the English Language' (1865); 'Parser and Analyzer for Beginners' (1869); an 'Anglo-Saxon Grammar' (1870); an 'Anglo-Saxon Reader' (1870), and an 'Introduction to Anglo-Saxon' (1871). Consult 'Publications' (Modern Language Association of America, Vol. XXIX, 1914).

MARCH, Peyton Conway, American soldier: b. Easton, Pa., about 1862. He is a son of Francis A. March, the philologist. Graduating from Lafayette College in 1884, he determined upon a military career, and graduated from the military academy in 1888. The same year he entered the army as a lieutenant of artillery. Later he graduated from the Fort Monroe Artillery School. When the Spanish War broke out he volunteered, and commanded the Astor Battery in 1898; the following year he was major of the 33d Volunteer Infantry. He served in Luzon, in the Philippine campaign, and received several promotions for gallantry. He obtained the surrender of General Venancio, Aguinaldo's chief of staff. For a time after the close of active hostilities he was a military and later a civil governor in Ilocus. In 1911 he was commissary-general in the Philippines; in 1916 he was a lieutenant-colonel of field artillery; the next year he was made a brigadier-general, and 5 Aug. 1917 he was raised to the rank of major-general. In 1918, the active chief of staff of the United States army.

MARCH, märh, Austria-Hungary, the principal river of Moravia, rising on the Silesian boundary, and flowing 214 miles southward to the Danube, which it joins six miles above Presburg. It is navigable for small boats from Göding, 50 miles from its mouth. In its lower course it forms the boundary between Austria and Hungary. Its chief affluent is the Thaya.

MARCH, in Europe, a frontier or boundary of a territory; especially applied to the boundaries or confines of political divisions; as, for example, the frontiers between England and Scotland, and England and Wales. Geneva is situated in the Marches of France, Savoy and Switzerland. See MARCHES, THE.

MARCH (Latin *Martius*), (1) the third month of the year, originally the first of the Roman year; so named in honor of the Roman deity Mars. Prior to 1752 the 25th of March was the first day of the legal year; hence, in all records, January, February and the first 24 days of March have frequently two years appended, as January 1, 170½ or 1701–2. (See CALENDAR). Until late in the 19th century, the custom of leasing dwellings from the 25th of March persisted in some localities. (2) A movement by regular steps in the manner of soldiers; also a journey performed by a body of soldiers either on foot or on horseback. Soldiers on a march are subject to certain rules very necessary to keep them in good order, and fit to meet the enemy. The march in the first sense of regular step differs on different occasions. In the parade-march from 75 to 95 steps, each of about 30 inches, differing in different armies, are made in a minute; in the quick-march from 108 to 115 steps; and in the double quick 150 running paces. This last cannot be sustained for any length of time, and is only used in a charge, or in storming a commanding position, and in a few internal movements of regiments. (3) A musical composition, chiefly for military bands, with wind instruments, primarily intended to accompany the marching of troops. There are slow and quick marches, and marches peculiar to different countries. Marches are also introduced into oratorios, the best-known examples being the 'Dead March' from the oratorio of 'Saul' and Mendelssohn's 'Wedding March.' See MUSIC.

MARCH FLIES, small, hairy, scavenging flies of the family *Bibionidæ*, seen numerously in early spring, often before the snow has disappeared. The species are over 300, and some appear in vast swarms. The maggots hatch in refuse or manure upon the ground, and are believed to feed upon grass-roots.

MARCH TO THE SEA. There were two plans for a march to the sea by Sherman's army, the first General Grant's, the second General Sherman's, modifying the first. A campaign to the sea to divide the Confederacy was decided upon by General Grant in January 1864, when he was in command of the Military Division of the Mississippi, with headquarters at Nashville. His objectives on the coast were first Mobile, second, Savannah, Atlanta being the intermediate objective for both. Sherman's army was then in the vicinity of Chattanooga, Tenn., and Ringgold, Ga.

In a letter to General Halleck, dated at Nashville, 15 Jan. 1864, General Grant wrote: "I look upon the next line for me to secure, to be that from Chattanooga to Mobile, Montgomery and Atlanta being the important intermediate points." This he repeated on 19 January to General Thomas, then in command of the Army of the Cumberland at Chattanooga, and this officer immediately began to gather information, which General Grant desired, of the number of troops necessary to guard the roads and bridges from Nashville to Atlanta. These preparations were entrusted to General Thomas, as General Sherman was engaged with his Meridian campaign. In this connection, General Thomas expressed his confidence in being able with the Fourteenth and Fourth corps in advance, covered with a strong division of cavalry, and the Eleventh corps in reserve, to overcome all opposition as far as Atlanta.

When Grant was made lieutenant-general and ordered east to command all the armies, he called Sherman to Nashville, and they traveled together as far as Cincinnati. General Sherman was then made acquainted with the plans already set forth. As part of these plans, before leaving Nashville General Grant ordered Banks to concentrate at least 25,000 men to move against Mobile in the spring in co-operation with General Sherman.

In addition to letters to each of the commanders interested — Halleck, Sherman, Thomas and Banks — General Grant, 26 March 1864, sent all army commanders a map upon

which was indicated by red lines the territory occupied by the Union forces at the beginning of the war, and at the opening of the campaign of 1864. The territory which it was proposed to occupy by the campaigns about to begin was indicated by the blue lines. This map reached General Sherman 4 April, and its receipt was acknowledged by him. This map is reproduced in the Atlas of the 'Official Records' of the war, being plate 135 A of that publication. For Sherman's proposed campaign the blue lines extend from Chattanooga to Atlanta, and from this latter point both to Mobile and Savannah.

General Sherman, in acknowledging the map, said; "That map to me contains more information and ideas than a volume of printed matter. Keep your retained copies with infinite care, and if you have occasion to send out to other commanders any more I would advise a special courier. From that map I see *all*, and glad am I that there are minds now at Washington able to devise; and for my part, if we can keep our counsels, I believe I have the men and ability to march square up to the position assigned me, and to hold it."

As the result of the campaign for Atlanta General Slocum occupied that city 2 September. Meantime Farragut had taken possession of Mobile Bay 5 August. On 10 September Grant telegraphed Sherman from City Point as follows: "As soon as your men are properly rested, and preparations can be made, it is desirable that another campaign should be commenced. We want to keep the enemy continually pressed to the end of the war. If we give him no peace while the war lasts, the end can not be far distant. Now that we have all of Mobile Bay that is valuable, I do not know, but it will be the best move for Major-General Canby's troops to act upon Savannah, while you move on Augusta. I should like to hear from you, however, on this matter."

To this Sherman telegraphed in reply: "If you can manage to take the Savannah River as high as Augusta, or the Chattahoochee as far up as Columbus, I can sweep the whole State of Georgia, otherwise I would risk our whole army by going too far from Atlanta."

In a letter from Atlanta, dated 20 September, Sherman gave Grant the conditions under which he could successfully co-operate in a movement on Savannah: "If you will secure Wilmington and the city of Savannah from your centre, and let General Canby have command over the Mississippi River and the country west of it, I will send a force to the Alabama and Appalachicola, provided you give me 100,000 of the drafted men to fill up my old regiments; and if you will fix a day to be in Savannah I will insure our possession of Macon and a point on the river below Augusta."

General Grant thereupon conferred by letter with General Halleck in regard to establishing a base on the coast for General Sherman and providing supplies, giving his own opinion that Savannah could be captured by troops from the East assisted by those in the Department of the South, and that the line of Augusta and Savannah would be a better one than Montgomery, Selma and Mobile. Grant further said in this letter 4 October: "Whichever way Sherman moves he will undoubtedly encounter Hood's army, and in crossing to the sea-coast will sever the connection between Lee's army and his section of the country."

General Sherman fixes the day after his letter of 20 September as the date when his plan of a march to the sea came first into his mind. It differed from Grant's plan based upon first disposing of Hood's army, in that it involved leaving Hood in his rear, to be taken care of by Thomas, and marching through to Savannah with no enemy in his front. Upon this plan a discussion arose with Grant, who for some time held to the necessity of first dealing with Hood. This discussion between Grant and Sherman lasted for several weeks. While it was in progress Hood became active. On 20 September Forrest's cavalry began vigorous operations about Athens and Decatur, Ala., and Pulaski, Tenn. Sherman at once sent troops to Chattanooga and 28 September General Thomas was ordered to proceed to Nashville to organize a force to meet a possible northward move of Hood. The first attempt of the latter was to break Sherman's communications by heavy movements upon his railroad. These met with only temporary success, as Sherman promptly pursued. The fighting at Allatoona 5 October was the most prominent affair. Hood then moved to the westward, and occupied Gadsden, Ala. Sherman again followed as far as Gaylesville. Sherman, 10 October, again proposed to Grant to leave Hood and march to the sea. Grant replied the same day. "If you are satisfied the trip to the sea-coast can be made, holding the line of the Tennessee firmly, you may make it, destroying all the railroads south of Dalton or Chattanooga as you think best." This condition of firmly holding the line of the Tennessee held Sherman for a time. Although this conditional permission had been given by Grant, he telegraphed Sherman 1 November: "Do you not think it advisable, now that Hood has gone so far north, to entirely settle with him before starting on your proposed campaign? With Hood's army destroyed you can go where you please with impunity." Sherman learned, 26 October, that Hood's army had appeared about Decatur. This clearly indicated an invasion of Tennessee. General Sherman then decided to strengthen General Thomas, leave him to take care of Hood, withdraw his own army to Atlanta and prepare for a march to the sea provided General Grant's consent could finally be obtained. He sent the Fourth and the Twenty-third corps back to Thomas. Thus the discussion with Grant over the question of first destroying Hood continued until 1 November, when, in response to a later telegram on that day from Sherman, which represented that Hood's whole force was only from 37,000 to 40,000, while Thomas would have from 63,000 to 70,000, and that he himself had retained only 50,000 men for his proposed campaign to the coast, General Grant telegraphed, "With the force, however, that you have left with General Thomas, he must be able to take care of Hood and destroy him. I really do not see that you can withdraw from where you are, without giving up all that we have gained in territory. I say then go on as you propose."

Having obtained this permission Sherman pushed his preparations with the greatest energy. The entire population of Atlanta had

already been deported; the various divisions of the army designed for the march were ordered to concentrate at Atlanta; all mills and factories at Rome were burned; the surplus stores, the sick, convalescent, and many thousands whose terms of service were about to expire were rushed to Chattanooga; the garrisons south of that place were withdrawn, and the railroad destroyed. Every command was carefully inspected, and soldiers found in any degree physically unsound were dispatched to Nashville. Care was taken that every man's accoutrements were complete. In the same way the horses, mules and trains were inspected. Wilson's cavalry was dismounted to make Kilpatrick's division perfect, and the remnants sent with Wilson to Nashville.

The march to the sea began on the morning of 15 November. As General Sherman wrote: "It surely was a strange event — two armies marching in opposite directions, each in the full belief that it was achieving a final and conclusive result in a great war;—" Hood's army, which had required the active work of three armies from May until September to push it back to Atlanta, had crossed the Tennessee at Decatur, strengthened by Forrest's cavalry and aiming for Nashville and the Ohio River. The situation at Nashville was thus described by Sherman: "General Thomas was at Nashville, with Wilson's dismounted cavalry and a mass of new troops and quartermaster's employees amply sufficient to defend the place. The Fourth and Twenty-third corps, under Generals Stanley and Schofield, were posted at Pulaski, Tennessee, and the cavalry of Hatch, Croxton and Capron, were about Florence, watching Hood. Smith's (A.J.) two divisions of the Sixteenth corps were still in Missouri, but were reported as ready to embark at Lexington for the Cumberland River and Nashville. Of course, General Thomas saw that on him would likely fall the real blow, and was naturally anxious."

Sherman started with 62,204 officers and men. Of his army he wrote: "The most extraordinary efforts had been made to purge this army of non-combatants and of sick men, for we knew well that there was to be no place of safety save with the army itself; our wagons were loaded with ammunition, provisions and forage, and we could ill afford to haul even sick men in the ambulances, so that all on this exhibit may be assumed to have been able-bodied, experienced soldiers, well armed, well equipped and provided, as far as human foresight could, with all the essentials of life, strength and vigorous action."

The artillery, wagon and ambulance trains were perfect. Each gun, caisson and forge was drawn by eight horses. There were 2,500 wagons with six mules to each, and the ambulances each had two horses. Each soldier carried 40 rounds, and in the ammunition wagons were 200 rounds for men and artillery.

The right wing, Gen. O. O. Howard, was composed of the Fifteenth and Seventeenth corps; the left wing, Gen. H. W. Slocum, of the Fourteenth and the Twentieth.

The war had not produced a more thoroughly organized and equipped army, or one in which more men had passed a thorough physical inspection. As it started for the sea, General Sherman in his 'Memoirs' thus describes the feelings of the men, and his own: "There was a devil-may-care feeling pervading officers and men, that made me feel the full load of responsibility, for success would be accepted as a matter of course, whereas, should we fail, this 'march' would be adjudged the wild adventure of a crazy fool." This question was to be decided at Nashville, as General Sherman wrote the day after he entered Savannah: "Thomas' complete success is necessary to vindicate my plans for this campaign—" The march to the sea cannot, therefore, be fully understood without considering the Nashville campaign as one of its essential parts. See NASHVILLE, CAMPAIGN AND BATTLE OF.

Sherman's army was composed of 55,329 infantry, 5,063 cavalry, and 1,812 artillery. There were two corps, 13 infantry divisions, one cavalry division, 36 brigades of infantry, two of cavalry and 16 batteries. There was no Confederate army between Atlanta and Savannah. Wheeler's cavalry was active on the flanks guarded by Kilpatrick's cavalry, and a considerable force of militia was encountered at Griswoldville.

The order for this historic march clearly presents its organization, its order of daily movement, its methods of living upon the country, the restrictions placed on its dealings with citizens, in short, the whole military machinery of the campaign. It, therefore, deserves a place in every history of the March to the Sea, General Sherman himself holding that no account of that event could be perfect without it. It was as follows:

(Special Field Orders, No. 120).

Headquarters Military Division of the Mississippi. In the Field, Kingston, Georgia, November 9, 1864.

1. For the purpose of military operations, this army is divided into two wings, viz.:

The right wing, Major-General O. O. Howard commanding, composed of the Fifteenth and Seventeenth corps; the left wing, Major-General H. W. Slocum commanding, composed of the Fourteenth and Twentieth corps.

2. The habitual order of march will be, wherever practicable, by four roads, as nearly parallel as possible, and converging at points hereafter to be indicated in orders. The cavalry, Brigadier-General Kilpatrick commanding, will receive special orders from the commander-in-chief.

3. There will be no general train of supplies, but each corps will have its ammunition-train and provision-train, distributed habitually as follows: Behind each regiment should follow one wagon and one ambulance; behind each brigade should follow a due proportion of ammunition-wagons, provision-wagons, and ambulances. In case of danger, each corps commander should change this order of march, by having his advance and rear brigades unencumbered by wheels. The separate columns will start habitually at 7 A. M., and make about fifteen miles per day, unless otherwise fixed in orders.

4. The army will forage liberally on the country during the march. To this end, each brigade commander will organize a good and sufficient foraging party, under the command of one or more discreet officers, who will gather, near the route traveled, corn or forage of any kind, meat of any kind, vegetables, corn-meal, or whatever is needed by the command, aiming at all times to keep in the wagons at least ten days' provisions for his command, and three days' forage. Soldiers must not enter the dwellings of the inhabitants, or commit any trespass; but, during a halt or camp, they may be permitted to gather turnips, potatoes, and other vegetables, and to drive in stock in sight of their camp. To regular foraging-parties must be entrusted the gathering of provisions and forage, at any distance from the road traveled.

5. To corps commanders alone is entrusted the power to destroy mills, houses, cotton-gins, etc.; and for them this general principle is laid down: In districts and neighborhoods where the army is unmolested, no destruction of such property should be permitted; but should guerillas or bushwhackers molest our march, or should the inhabitants burn bridges, obstruct roads, or otherwise manifest local hostility, then army commanders should order and enforce a devastation more or less relentless, according to the measure of such hostility.

6. As for horses, mules, wagons, etc., belonging to the inhabitants, the cavalry and artillery may appropriate freely and without limit; discriminating, however, between the rich, who are usually hostile, and the poor and industrious, usually neutral or friendly. Foraging parties may also take mules or horses, to replace the jaded animals of their trains, or to serve as pack-mules for the regiments or brigades. In all foraging of whatever kind, the parties engaged will refrain from abusive or threatening language, and may, where the officer in command thinks proper, give written certificates of the facts, but no receipts; and they will endeavor to leave with each family a reasonable portion for their maintenance.

7. Negroes who are able-bodied and can be of service to the several columns may be taken along; but each army commander will bear in mind that the question of supplies is a very important one, and that his first duty is to see to those who bear arms.

8. The organization, at once, of a good pioneer battalion for each army corps, composed if possible of negroes, should be attended to. This battalion should follow the advance-guard, repair roads and double them if possible, so that the columns will not be delayed after reaching bad places. Also, army commanders should practise the habit of giving the artillery and wagons the road, marching their troops on one side, and instruct their troops to assist wagons at steep hills or bad crossings of streams.

9. Captain O. M. Poe, chief-engineer, will assign to each wing of the army a pontoon-train, fully equipped and organized; and the commanders thereof will see to their being properly protected at all times.

By order of Major-General W. T. Sherman,
L. M. Dayton, Aide-de-Camp.

Leaving Atlanta in ruins, 15 November, the left wing, which General Sherman accompanied, marched by Decatur, Stone Mountain and Covington. At this point it turned toward Milledgeville, the capital of Georgia, which was the first objective. It was reached on the 22d. Meantime the right wing had marched by Jonesboro, McDonough and Monticello, and was in communication with Sherman at Gordon. Kilpatrick's cavalry, which was operating on the right of the advance, kept in contact with Wheeler's cavalry, and reached the defenses of Macon, thence retiring to Griswoldville, where Walcutt's brigade of Wood's division was halted as a rear-guard. Gen. G. W. Smith attacked Walcutt, but was repulsed (see GRISWOLDVILLE, BATTLE OF). Governor Brown, the State officers and members of the legislature left the capital on Sherman's approach. The arsenal and various public buildings were destroyed.

The march was resumed 24 November, with Millen as the next objective. The two wings followed the general line of the railroad. Millen was reached 3 December. From Millen the army proceeded by the four main roads for Savannah. The effort of the Confederate authorities to organize a force at Augusta to attack Sherman in flank failed, and the march to Savannah was only slightly disturbed by the persistent skirmishing of Wheeler's cavalry. McLaw's division of Hardee's force had advanced to Ogeechee Church, but fell back to the city upon Sherman's approach. The several corps reached the defenses of Savannah 9 and 10 December, and occupied a line from the Ogeechee River on the right to the Savannah River on the left. Hardee occupied the city with something less than 10,000 men. Sherman's effective force numbered a little over 60,000. Hood held the Savannah River below Sherman's lines.

The march had cut a swath of many miles in width through the richest part of Georgia. The heads of the columns and the flanks swarmed with foraging parties, and a country which was daily scoured to supply food for a marching column of 60,000 soldiers was of necessity stripped of provisions, and of everything else that could contribute to the use or comfort of an army. Railroads had been destroyed for long distances, and all factories and other buildings burned which could contribute to army purposes. There had been no fighting worth mentioning, Griswoldville excepted, and that had only involved one Union brigade.

General Sherman had left Atlanta with 62,204 officers and men of all arms. He reached Savannah with 60,057. On the march 103 were killed, 428 wounded, 278 missing and 1,338 captured. Of those captured, a large proportion were foragers, better known in army vernacular as "bummers."

The night of 12 December a bridge had been completed over the Ogeechee, and the next morning Hazen's division crossed and marched at once to assault Fort McAllister (q.v.) and open the way to the sea. An hour before sunset the assault was delivered and the fort taken.

This success gave Sherman communication with the fleet which was awaiting him with supplies, and mails for the army.

General Slocum, upon establishing his flank on the Savannah River, had captured two steamboats and sent a force to Hutchinson and Argyle islands just above the city, and sought permission to transfer a corps to the left bank of the river to close Hardee's only line of escape, General Slocum having already sent a brigade under Col. E. A. Carman to the South Carolina shore. General Sherman did not deem this prudent, and as a result Hardee later withdrew his entire force intact and without molestation.

On 17 December General Sherman sent in a flag of truce demanding Hardee's surrender on the ground that he (Sherman) had received guns that could "cast heavy and destructive shot as far as the heart of the city"; that he controlled all avenues by which the city could be supplied with food; that he would grant liberal terms, but if forced to assault he should "feel justified in resorting to the harshest measures," and should make little effort to restrain his army.

General Hardee returned a defiant reply, saying he was not shut in, but had free and constant communication with his department. To the specific call for surrender he replied: "Your demand for the surrender of Savannah and its dependent forts is refused."

General Sherman then proceeded by boat to General Foster's headquarters at Hilton Head to request that a division be sent to occupy the road north of the Savannah River, which line of communication was still open to Hardee. On his return he received the news that during his absence Hardee had put down his bridges and withdrawn with his entire force. The next day General Sherman's forces occupied Savannah.

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H. V. BOYNTON.

MARCHAND, mär-shäñ, **Félix Gabriel,** Canadian legislator and author: b. Saint John's, province of Quebec, 9 Jan. 1832; d. 1900. He was educated at Saint Hyacinth College, was admitted a notary public in 1855, entered practice at Saint John's, and from 1867 sat for the county of Saint John's in the legislative assembly of the province of Quebec. From 8 March 1878 to 19 March 1879 he was provincial secretary, from 19 March to 30 Oct. 1879 was commissioner of Crown lands, and from 29 Jan. 1887 to 1892 speaker of the assembly. In 1897 he became Premier, with the Treasury portfolio. Subsequent to the invasion at Eccles Hill during the Fenian troubles (1870), he commanded a militia brigade. He did much to improve Canadian journalism, and for many years was proprietor and editor of *Le Franco-Canadien.* He published a 'Manuel et Formulaire du Notariat'; and also the comedies 'Fatenville' and 'Erreur n'est pas Compte' in prose, and 'Un Bonheur en Attire un Autre' and 'Les Faux Brillants' in verse.

MARCHAND, Jean Baptiste, French officer and explorer: b. Thoissey, Ain, 1863; d. 16 May 1917. He entered the army in 1883 and after gaining a commission three years later won fame as an explorer, particularly in Africa. He sought an improved route from the valley of the Niger to the Gulf of Guinea. He became one of the most notable figures in the French public life because of his clash with Lord Kitchener in 1898. Marchand had established the post of Fashoda on the White Nile and had resisted several attacks of the dervishes, when General Kitchener appeared at the head of a British force and requested Marchand to withdraw. The latter refused and soon after departed for France to make his report but the French government receded from its position and the threatened clash between England and France was averted. Marchand was present at the relief of Peking in 1902 and resigned his commission in 1904, when his government refused him permission to enter the Russian army in the war with Japan. He was made Commander of the Legion of Honor, was again in the French army with rank of general in the Great War and was killed in action on the western front. Consult Murphy, 'Le commandant Marchand et ses compagnons d'armes à travers l'Afrique' (Paris 1900).

MARCHANT, mär'chănt, **James,** English reformer: b. 18 Dec. 1867. He was educated in private and public schools and for some years was engaged as social writer and worker in East London and the provinces. In 1889–94 he was evidential lecturer to the bishop of Saint Albans; in 1895–97 preacher-in-charge of the Trinity Presbyterian Church, London; and in 1900–02 was civil minister of Saint Andrew's Church, Chatham. From 1903 to 1906 Mr. Marchant was secretary of Dr. Barnardo's Homes and Memorial. In 1905 he traveled on the Continent with Dr. Barnardo's successor investigating conditions of child-life and rescue work. In November 1911 he was dedicated to the work of the National Council of Public Morals in the private chapel of the dean of Westminster Abbey by the bishop of Durham and Rev. F. B. Meyer. His writings include 'Life of Dr. Paton' (1909); joint-author of 'The Memoirs of Dr. Bernardo' (1907); 'Letters and Reminiscences of Dr. A. Russel Wallace' (1916); 'History of the House of Cassell' (1917); 'The Master Problem' (1917); 'Coffins or Cradles' (1916); 'Birth-Rate and Empire' (1917); 'The Person of Christ'; 'Theories of the Resurrection' (1899). He is editor of *Prevention,* a scientific and religious journal devoted to race culture and public morals.

MARCHES, The, Italy, a territory now included in the kingdom, but formerly constituting one of the legations of the Papal States. It comprises the region lying between the Apennines and the Adriatic, and is divided into the modern four provinces — Urbino and Pesaro, Ancona, Macerata and Ascoli Piceno. See ITALY.

MARCHESI, mär-kā'sē, **Mathilde,** German singer: b. Frankfort-on-Main, 26 March 1826; d. 17 Nov. 1913. Her maiden name was Graumann; she studied under Nicolai in Vienna, and in Paris under Garcia, whose assistant she became. A splendid mezzo-soprano she toured Europe for several years, married, in 1852, the Marchese della Rajata Castrone, a political Italian refugee of 1848, also a singer, who had adopted the *nom de théâtre* of Salvatore Marchesi, and in 1854 became professor at the Vienna Conservatory. She removed to Paris in 1861, where she published her "École de Chant." In 1865 she accepted a professorship in Cologne, but resigned in 1868 and returned to Vienna, staying at the Conservatoire 10 years. She settled in Paris again in 1881, and prepared many of the greatest singers of the younger generation, including Melba. Her later years were spent in London, where she conducted a singing academy with her daughter. She was a teacher of rare merit, and author of a method of singing, of two volumes of personal recollections in German (1877; 1888), and of 'Marchesi and Music' (1897). She received decorations and medals from the rulers of Italy, Great Britain, Germany and Austria.

MARCHIALI, mär-kē-ä'lē, or **MARCHIALY.** See IRON MASK, MAN WITH THE.

MARCHING THROUGH GEORGIA, a popular ballad sung during the American Civil War, and commemorating Sherman's March to the Sea. It was written by H. C. Work (q.v.) 16 Nov. 1864.

MARCIL, mär'sēl', **Charles,** Canadian statesman and journalist: b. Sainte Scholastique, Quebec, 1 July 1860. He was educated in the common schools and at Ottawa University. In 1879 he became a member of the staff of the Montreal *Gazette,* and subsequently was successively member of the staffs of the *Herald,* the *Post, La Patrie,* and the *Star,* all of Montreal. In 1897 Mr. Marcil was an unsuccessful candidate for the Quebec legislative assembly for Gaspé County. In 1900 he was elected to the Dominion Parliament as Liberal member for Bonaventure; in 1905 he became deputy speaker and in 1909–11 was speaker of the House of Commons. Mr. Marcil became a member of the Privy Council for Canada in 1911.

MARCION, mär'shi-ŏn, founder of a Gnostic sect, called Marcionites: b. Sinope about the beginning of the 2d century, A.D.; d. about 160. He became a wealthy shipowner, was very liberal, and went to Rome about 140 where he

gave generously to the Church but his views were so unusual that he was not warmly received. He attached himself while there to the Gnostic teacher Cerdo of Antioch, and founded a system antagonistic in many respects to Christianity. Its principal feature was the irreconcilable opposition which it supposed to exist between the Creator and the Christian God, and between the religious systems, the law and the gospel, which it believed they respectively founded The sect held the existence of three original principles — the supreme and invisible, whom Marcion called the Good; the visible God, the Creator; and the devil, or perhaps matter, the source of evil. Marcion could not perceive in nature, or in the Old Testament, the same love which was in the gospel of Christ. He accordingly made the Creator, the God of the Old Testament, the author of suffering. Jesus was not the Messiah promised by this being, but the son of the unseen God, who took the form but not the substance of man. Marcion denied the resurrection of the body; he condemned marriage, thinking it wrong to increase a race born in subjection to the harsh rule of the Creator. He rejected the whole of the Old Testament, and of the New all except a few epistles and a mutilation of the Gospel of Luke. He lead quite a following, which is traced for 500 years, and then disappeared. Consult Tertullian, 'Contra Marcionem'; Harnack, 'History of Dogma.'

MARCO BOZZARIS. See BOZZARIS, MARCOS.

MARCO POLO. See POLO, MARCO.

MARCOMANNI, märk-kō-măn'nī ("men of the marches," "borderers"), ancient German tribe, belonging to the federation of the Suevi. About 10 B.C., under their King Marbod or Maroboduus, they retired from their territory between the Elbe and the Oder before the advance of the Romans, settled in Bohemia, and there built up a powerful state, with which Tiberius made a treaty 6 A.D. Thirteen years later Maroboduus was defeated by Hermann, or Arminius, leader of the Cherusci, who also drove from power Catualda, Marbod's successor. About the middle of the 2d century the Marcomanni, with other Teutonic tribes, attempted to make inroads into Pannonia; they were defeated by Marcus Aurelius in 178; Commodus made peace with them in 180; they furnished Roman troops and were heavily subsidized till the time of Aurelian, when in 270 they were again rebellious and again driven across the Danube. In the 4th century the Marcomanni drop out of history.

MARCONI, Guglielmo, gool-ĕ-ĕl'mō märkō'nē, Italian inventor and electrical engineer: b. Marzabotto, near Bologna, Italy, 23 Sept. 1875. He was educated at the universities of Bologna and Padua, and so early as 1890 undertook experiments in demonstration of his theory that the electric current readily passes through any substance, and when started in a given direction follows a direct course without the assistance of any sort of conductor. After various experiments in Italy, he finally invented an apparatus for wireless telegraphy, which was successfully tested in both Italy and England by Sir William Henry Preece, engineer and electrician-in-chief of the English postal-telegraph service. Marconi was the first to perfect the appliances used in space telegraphy or radiography, and the first to patent the application of the electric waves discovered by Heinrich Hertz to the purposes of actual telegraphy as distinguished from mere signaling. This remains true in spite of all the discussion respecting the originality of Marconi's work. It was he who combined the important elements of the wireless telegraph that had previously been invented, and to him the scientific triumph of so-called "wireless" telegraphy is due. He came to the United States in 1899, there continued his experiments, and in 1900 employed his method in reporting the presidential election of that year. He had sent (27 March 1899) messages across the English Channel from the vicinity of Boulogne, France, to the South Foreland, England, 32 miles distant. In December 1901 he began his first experiments in transatlantic telegraphy without wires at Signal Hill, at the entrance to the harbor of Saint John's, N. F. He succeeded with these because of an exceedingly sensitive magnetic detector, that was affected by the very faint etheric vibrations. When his success became apparent through his receiving and plainly distinguishing signals from the Poldhu Station, England, the Anglo-American Cable Company, which holds a monopoly from Newfoundland, compelled him to withdraw, and he selected another station at Table Head, on the east of Glace Bay, Cape Breton Island. On 25–26 Feb. 1902, Marconi, on his way to the United States on board the steamship *Philadelphia,* received signals at a distance of 2,099 miles and worded messages at a distance of 1,551.5 miles. On 21 Dec. 1902 the first official transatlantic telegrams were sent from Table Head. Marconi later (18 Jan. 1903) sent from the South Wellfleet station, Cape Cod, Mass., direct to Poldhu (3,000 miles), a message from President Roosevelt to King Edward. In 1910 the Argentina station received messages of 5,600 miles transit, and since then South American stations have sent and received about 7,000 miles. The Italian government early introduced the Marconi system on its warships, and granted an annual subsidy of $200,000. The English government also paid a royalty for the use of the system on its ships. On 18 Oct. 1907 the Marconi system between Nova Scotia and Ireland was formally opened for commercial service.

He has continued his experiments and inventions, continually improving radiography and the methods employed. In 1906 his new persistent wave system was introduced, and devices developed for giving desired forms to the wave energy sent out. In 1910 his detector was radically improved, and he also brought into use a new receiver. A little later he developed a duplex by which messages could be sent and received at the same time by the same apparatus, without conflict, as is done in regular wire telegraphy. Mr. Marconi has received numerous honors, in Italy, England, America and also in Continental Europe. He divided the Nobel prize for physics with Ferdinand Braun in 1909. He has been decorated in Britain, Russia and Spain, and received the Grand Cross of the Crown of Italy. The great universities of the world have showered degrees on him; Edison accepted official position in one of his companies; he was nominated a senator in the kingdom of Italy, and given the

freedom of Rome. When Italy joined in the World War, he hastened to offer his services to his country, and was promptly placed in charge of its wireless service.

MARCOU, mär-koo', **Jules,** American geologist: b. Salins, France, 20 April 1824; d. Cambridge, Mass., 17 April 1898. He studied at Besançon and the Collége de Saint Louis in Paris; devoted himself to geology after several journeys through Switzerland, in which he made the acquaintance of Jules Thurmann, to whom he owed an introduction to Louis Agassiz. In 1846, after taking part in the geological survey of the Jura Mountains, he was appointed assistant mineralogist in the Sorbonne; in 1848 having been appointed traveling geologist to the Jardin des Plantes came to America, explored the Lake Superior Country together with Agassiz and made wide and important geological studies in Virginia, Pennsylvania and New Jersey, and after several trips back to Europe settled in Cambridge, where he assisted Agassiz in the Museum of Comparative Zoology. From 1853 to 1855 he was in government employ, and from 1875 till shortly before his death was again in the service. Marcou made a section map of the 35th parallel from the Mississippi to the Pacific, and published 'Geological Map of the United States and British Provinces of North America' (1853); 'A Catalogue of Geological Maps of America' (1884): 'Geology of North America' (1858); 'Life, Letters and Works of Louis Agassiz' (1896).

MARCOUX, Joseph, Canadian missionary: b. Canada, about 1770; d. 1855. He was educated after the usual manner of the Roman Catholic priesthood of which he became a member. Soon after his ordination his ecclesiastical superiors dispatched him as missionary to the Iroquois. In 1819 he settled among these Indians at Caughnawaga, on the Saint Lawrence, near Montreal. His labors were eminently successful and under his guidance the Indians reached a high degree of civilization. The school and church at Caughnawaga are monuments to the zeal of this modern apostle. Father Marcoux acquired a perfect mastery of the Iroquois tongue, of which he published a grammar and dictionary. Other works by him in Iroquois are 'Life of Christ'; 'Letters to Iroquois Chiefs' (1848–49); 'Prayer Book' (1852); 'Catechism' (1854).

MARCUS AURELIUS ANTONINUS, mär'kŭs â-rē'li-ŭs, often called simply MARCUS AURELIUS, a distinguished Roman, and according to Canon Farrar "the noblest of pagan emperors": b. Rome, 29 April 121 A.D.; d. Vindobona,— the modern Vienna — 17 March 180 A.D. He was descended from an illustrious line which tradition declared extended to the good Numa, the second king of Rome. In the descendant Marcus were certainly to be found, with a great increment of many centuries of noble life, all the virtues of his illustrious ancestor. Doubtless the cruel persecutions of the infamous emperors who preceded Hadrian account for the fact that the ancestors of Aurelius left the imperial city and found safety in Hispania Bætica, where, in a town called Succubo — not far from the present city of Cordova — the emperor's great-grandfather, Annius Verus, was born. From Spain also came the family of the Emperor Hadrian, who was an intimate friend of Annius Verus. The death of the father of Marcus Aurelius when the lad was of tender years led to his adoption by his grandfather and subsequently by Antoninus Pius. By Antoninus he was subsequently named as joint heir to the imperial dignity with Commodus, the son of Ælius Cæsar, who had previously been adopted by Hadrian. From his earliest youth Marcus was distinguished for his sincerity and truthfulness. "Hadrian's bad and sinful habits left him," says Niebuhr, "when he gazed on the sweetness of that innocent child. Punning on the boy's paternal name of Verus, he called him Verissimus, 'the most true.' " Among the many statues of Marcus extant is one representing him at the tender age of eight years offering sacrifice. He was even then a priest of Mars. It was the hand of Marcus alone that threw the crown so carefully and skilfully that it invariably alighted upon the head of the statue of the god. The entire ritual he knew by heart. The great Emperor Antoninus Pius lived in the most simple and unostentatious manner, yet even this did not satisfy the exacting, lofty spirit of Marcus. At 12 years of age he began to practise all the austerities of Stoicism and became a veritable ascetic. He ate most sparingly; slept little, and when he did so it was upon a bed of boards. Only the repeated entreaties of his mother induced him to spread a few skins upon his couch. His health was seriously affected for a time; and it was, perhaps, to this extreme privation that his subsequent feebleness was largely due. His education was of the highest order of excellence. His tutors, like Nero's, were the most distinguished teachers of the age; but unlike Nero, the lad was in every way worthy of his instructors. His letters to his dearly beloved teacher, Fronto, are still extant, and in a very striking and charming way they illustrate the extreme simplicity of life in the imperial household in the villa of Antoninus Pius at Lorium by the sea. They also indicate the lad's deep devotion to his studies and the sincerity of his love for his relatives and friends. When his predecessor and adoptive father, Antoninus, felt the approach of death, he gave to the tribune who asked him for the watchword for the night, the reply "Equanimity," directed that the golden statue of "Fortune" that always stood in the emperor's chamber should be transferred to that of Marcus Aurelius, and then turned his face and passed away as peacefully as if he had fallen asleep. The watchword of the father became the life-word of the son, who pronounced upon that father, in the 'Meditations,' one of the noblest eulogies ever written. It would be impossible here to detail even briefly all the manifold public services rendered by Marcus Aurelius to the empire during his reign of 20 years. Among his good works were these: the establishment, upon eternal foundation, of the noble fabric of the civil law — the prototype and basis of Justinian's task; the founding of schools for the education of poor children; the endowment of hospitals and homes for orphans of both sexes; the creation of trust companies to receive and distribute legacies and endowments; the just government of the provinces; the complete reform of the system of collecting taxes; the abolition of the cruelty of the criminal laws and the mitigation of sentences unnecessarily severe; the regulation of gladiatorial exhibitions;

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GUGLIELMO MARCONI

the diminution of the absolute power possessed by fathers over their children and of masters over their slaves; the admission of women to equal rights to succession to property from their children; the rigid suppression of spies and informers; and the adoption of the principle that merit, as distinguished from rank or political friendship, alone justified promotion in the public service. But the greatest reform was the reform in the imperial dignity itself, as exemplified in the life and character of the emperor. It is this fact which gives to the 'Meditations' their distinctive value. The infinite charm, the tenderness and sweetness of their moral teachings, and their broad humanity, are chiefly noteworthy because the emperor himself practised in his daily life the principles of which he speaks, and because tenderness and sweetness, patience and pity, suffused his daily conduct and permeated his actions. The horrible cruelties of the reigns of Nero and Domitian seemed only awful dreams under the benignant rule of Marcus Aurelius. It is not surprising that the deification of a deceased emperor, usually regarded by Senate and people as a hollow mockery, became a veritable fact upon the death of Marcus Aurelius. He was not regarded in any sense as mortal. All men said he had but returned to his heavenly place among the immortal gods. As his body passed, in the pomp of an imperial funeral, to its last resting-place, the tomb of Hadrian,—the modern Castle of Saint Angelo at Rome,—thousands invoked the divine blessing of Antoninus. His memory was sacredly cherished. His portrait was preserved as an inspiration in innumerable homes. His statue was almost universally given an honored place among the household gods. And all this continued during successive generations of men, Marcus Aurelius has been censured for two acts: the first, the massacre of the Christians which took place during his reign; the second, the selection of his son, Commodus, as his successor. In extenuation of his persecution of the followers of Christianity, it has been alleged in his behalf that he was deceived by evil councillors, who misrepresented the conduct of the Christians to him. This excuse impinges upon his wisdom as a ruler and his admittedly wide knowledge of the conditions of the empire. It is further urged that when we take into consideration the environment of the emperor, no just cause for condemnation of his course remains. He imbibed a bitter prejudice against the new religion from his beloved friend and instructor, Fronto. In the writings of Epictetus, whom he greatly revered, he found severe condemnation of the Christians as fanatics. With such a profound natural bias, it is urged, it is no wonder that he was led to regard the new creed with aversion. But the reason of his course is to be found rather in his deep-rooted attachment to the heathen beliefs of his ancestors and of the empire. It was rather his fear that the ancient cult, bound up as it seemed in the character of Roman rule, was seriously menaced by the progress of Christianity, which actuated him to the severe and bloody measures he took to root out a dangerous rival. He regarded Christianity as a "pernicious sect," a "secret conspiracy" against the empire, an "immoral superstition," whose poison was eating into the social life, and himself as the conservator of the empire and its traditions. Therefore some extenuation might be conceded to such fierce zeal in persecuting the Christians in almost any other emperor than Marcus Aurelius. But there is a glaring inconsistency in his character in the adoption of so cruel and monstrous a course by one who appears otherwise so admirable. In this signal instance he is as bloody and heartless as a Domitian, a Nero or a Caligula; in all other things merciful, in this pitiless; in his general administration, just and humane; in this, singularly unjust and even vindictive. Whatsoever may be urged in his defense, this relentless persecution of the Christians is a dark blot on his fame. Whatever extenuating circumstances may seem to condone it, his policy in this instance was utterly inconsistent with his general character.

His first edict against the Christians was published in 177. Multitudes perished in the fierce persecutions which followed. Notable amongst the victims were Saint Polycarp in Smyrna and Saint Cecilia at Rome. The manner in which they were tortured before being relieved from sufferings by death was more befitting a savage chief than a civilized ruler.

Of the appointment of Commodus as his successor, it may be said that the paternal heart hoped against hope for filial excellence. Marcus Aurelius believed, as clearly appears from many passages in the 'Meditations,' that men did not do evil willingly, but through ignorance; and that when the exceeding beauty of goodness had been fully disclosed to them, the depravity of evil conduct would appear no less clearly. The emperor who, when the head of his rebellious general was brought to him, grieved because that general had not lived to be forgiven; the ruler who burned unread all treasonable correspondence, would not, nay, could not believe in the existence of such an inhuman monster as Commodus proved himself to be. The appointment of Commodus was a calamity of the most terrific character; but it testifies in trumpet tones to the nobility of the emperor's heart, the sincerity of his own belief in the triumph of right and justice. Compare Farrar, 'Seekers after God' (1868); Renan, 'Marc Aurèle' (1881); Pater, 'Marius the Epicurean'; Arnold, M., 'Essays in Criticism' (First Series, New York 1883); 'Marcus Aurelius Antoninus to Himself' (English tr. by G. H. Randall, London 1910); 'The Communings with Himself of Marcus Aurelius Antoninus, Emperor of Rome, together with his Speeches and Sayings' (tr. C. R. Haines, London 1916); 'The Thoughts of the Emperor Marcus Aurelius Antoninus' (tr. George Long, illustr. W. Russell Flint, London 1909). Consult also Robinson, Ellis, 'Correspondence of Fronto and Marcus Aurelius' (Oxford 1904).

MARCUS GRÆCUS, grē'kŭs, alchemist, who lived not later than the 11th century, since he is cited by an Arabian physician of that date. In the National Library at Paris are two manuscript copies of a small treatise, entitled 'Liber Ignium ad Comburendos Hostes, Auctore Marco Græco,' one of which appears to belong to the 14th and the other to the 15th century. The work contains an account of an explosive substance the ingredients of which are the same as those used in making gunpowder, though differently proportioned. It may have been that Schwartz, the reputed inventor of gunpowder,

did nothing more than experiment on the receipts of Marcus Græcus. The treatise also contains the first account that has come down to us of the method of making Greek fire.

MARCY, Henry Orlando, American surgeon: b. Otis, Mass., 23 June 1837. He was educated at Wilbraham Academy and Amherst College. In 1863–64 he was assistant surgeon in the Union armies, was medical director of Florida in 1864–65 and from 1865 to 1869 practised his profession at Cambridge, Mass. In 1869–70 he studied abroad at Berlin, London and Edinburgh, was the first American pupil of Dr. Lister, whose methods he introduced to America. After his return to the United States Dr. Marcy devoted his attention to laboratory and practical study of antiseptic methods of wound treatment. Since 1880 he has conducted a private hospital in Cambridge for the treatment of surgical diseases. In 1892 he was president of the American Medical Association, of the American Academy of Medicine in 1884. Dr. Marcy has published 'The Reproductive Process,' translation from G. B. Ercolane's work (2 vols., 1884); 'The Anatomy and Surgical Treatment of Hernia' (1892); 'The Radical Cure of Hernia' (1889); 'The Perineum, Its Anatomy and Surgical Treatment' (1889), also many monographs and papers on medical and other subjects.

MARCY, Randolph Barnes, American general: b. Greenwich, Mass., 9 April 1812; d. Orange, 22 Nov. 1887. He was educated at West Point in 1832; and served in the Black Hawk War. During the Mexican War he was active at Palo Alto and Resaca de la Palma; and was made inspector-general, United States army, with the rank of colonel, in August 1861, serving as chief of staff to his son-in-law, Gen. George B. McClellan throughout the Civil War. He was appointed brigadier-general of volunteers, 23 Sept. 1861, was inspector-general, United States army, with rank of brigadier-general from December 1878. He was retired in the year last named. He published 'Exploration of the Red River in 1852' (1853); 'The Prairie Traveler, a Handbook for Overland Emigrants' (1859); 'Thirty Years of Army Life on the Border' (1866); 'Border Reminiscences' (1871).

MARCY, William Learned, American statesman: b. Southbridge, Mass., 12 Dec. 1786; d. Ballston Spa, N. Y., 4 July 1857. He studied at Leicester Academy, in Massachusetts, and was graduated at Brown University in 1808. At Troy, N. Y., he studied law and was admitted to the bar. When the War of 1812 broke out he volunteered as a lieutenant, was sent at once into active service and 22 Oct. 1812 led an attack resulting in the capture of a Canadian post at Saint Regis. He was soon promoted to be captain, and served almost to the end of the war. Returning to Troy, he engaged in newspaper work and in politics, opposed Clinton and became prominent in the Albany Regency (q.v.). He had already held several offices when, in 1823, he was elected comptroller of the State. This position he filled six years, and in 1829 was appointed associate justice of the New York Supreme Court. The Democrats in 1831 elected him to the United States Senate, but the next year he was chosen governor of New York and resigned his senatorship. While in the Senate he was chairman of the Judiciary Committee, and in debate with Clay made a memorable defense of Martin Van Buren. It was during a speech in the Senate vindicating the course of the President in giving offices to his political supporters that Marcy uttered the words associated with the beginning of the spoils system (q.v.): "We can see nothing wrong in the maxim that to the victors belong the spoils." Having served three terms as governor, he was once more nominated, in 1838, but was defeated by W. H. Seward (q.v.). In the following year Marcy was appointed by President Van Buren a commissioner on Mexican claims, serving till 1842. In 1845 he became Secretary of War under Polk, and in that office bore arduous responsibilities created by the Mexican War. He also used his official influence in the settlement of the momentous Oregon boundary question. In 1848 he supported Cass as presidential candidate, and when Taylor was inaugurated Marcy retired to private life. But during the administration of Pierce he served from 1853 to 1857 as Secretary of State, greatly distinguishing himself at home and abroad by his handling of grave matters — the Mexican boundary dispute, the reciprocity treaty with Canada, the British fishery question, the Koszta affair (see INGRAHAM, DUNCAN NATHANIEL), etc. On the inauguration of President Buchanan in 1857 Marcy finally retired from office, dying four months afterward. Among statesmen of administrative ability and thorough training, both for domestic and foreign affairs, he holds a high and permanent place. Consult Alexander, 'Political History of the State of New York' (1906).

MARCY, Mount, N. Y., the highest peak of the Adirondack Mountains, in the northeastern part of the State, in Essex County, about 28 miles west of Lake Champlain. The altitude is 5,344 feet. Lake Tear of the Clouds, 4,327 feet above sea-level, usually considered the main source of the Hudson River, is just southwest of Mount Marcy. The Indian name for this peak was "Tahawas," meaning the "cloud-divider."

MARDEN, Orison Swett, American editor and author of "uplift" books: b. Thornton, N. H., about 1850. He was graduated at the Boston University in 1877; at the school of oratory there in 1879; at the law school of the same institution in 1881; and in 1882 at the Harvard Medical School. He was founder and editor of *Success* and later of the *New Success,* and is the author of many works, among which are 'Pushing to the Front' (1894); 'How to Succeed' (1896); 'The Secret of Achievement' (1898); 'Character the Grandest Thing in the World' (1899); 'The Hour of Opportunity' (1900); 'Talks with Great Workers' (1901); and 'Stepping Stones' (1902); 'Every Man a King' (1906); 'The Optimistic Life' (1907); 'Why Grow Old' (1909); 'Getting On' (1910); 'Self Investment' (1911); 'The Joys of Living' (1913; The Crime of Silence' (1915); 'Everybody Ahead' (1917).

MARDI GRAS, mär'dē grä, Shrove Tuesday, the last day before Lent. (See CARNIVAL). In the United States the day is observed in New Orleans and Memphis with processions masquerade balls and other gay entertainments.

MARDONIUS, mär-dō'nī-ŭs, Persian general, was the son of the Satrap Gobryas, and

son-in-law of Darius Hystaspes. He commanded the first Persian armament sent against Greece, 492 B.C., when a storm at Mount Athos destroyed his fleet, and his army was beaten in Macedonia. He accompanied Xerxes in his invasion of Greece, of which he had been the chief promoter; and after the battle of Salamis, and the return of Xerxes to Asia, Mardonius was left in occupation at Athens, which he held for 10 months. According to Herodotus he was defeated by Pausanias, and probably killed at the battle of Platæa, 479 B.C.

MARDUK. See MERODACH.

MARE CLAUSUM, mä'rē klâ'sŭm, a Latin phrase meaning closed sea, or that portion of the sea under the jurisdiction of a particular nation or government, as distinguished from the high sea. For many years it was held that a nation had no authority over waters more than three miles from its shores. But in the great World War these theories were cast to the winds, and each side held what sea it could. See INTERNATIONAL LAW.

MARE ISLAND, Cal., in San Pablo Bay, and a part of Solano County, 28 miles north of San Francisco, and opposite the city of Vallejo. A United States naval station, one of the largest in the country, is on this island. It is two miles long and has wet and dry docks, ordnance yards, marine barracks, a hospital, an observatory, repair shops, and at the southern extremity of the island a lighthouse. See NAVY YARD.

MAREE, Loch, lŏh mą-rē', Scotland, a lake in the west of Ross-shire, forming a long and comparatively narrow expanse, stretching southeast to northwest for 12½ miles with a breadth of from one-half to two miles. Its depth in most places is 60 fathoms; it has never been known to freeze. The scenery along its shores is bold and picturesque, and its surface is studded with 32 wooded islands, on one of which are found the remains of an ancient chapel, with a graveyard. One is Saint Swithin's Isle, shaped like a doughnut, enclosing a lake 750 feet long. The loch discharges itself into Lock Ewe by a small river of the same name.

MAREIA, mä-rā'ą, **Lake.** See MAREOTIS, LAKE.

MAREMMA, mä-rĕm'mä, Italy, low swampy tracts extending along the west coast of Tuscany from the mouth of the Cecina to Orbitello; length, 92 miles; breadth, from 6 to 20 miles; area, about 1,000 square miles. Formerly these regions were fruitful, healthful and populous; but after the 15th century the neglect of the water-courses of the district allowed the formation of marshes and now they generate insects and fevers and present an aspect of dreary desolation during the summer months, when the inhabitants flee from the pestilences. In winter, on the other hand, the Maremma are inhabitable and afford a luxuriant pasturage for cattle, which graze in summer on the Apennines. The district is gradually being reclaimed and improved.

MARENGO, Iowa, city, county-seat of Iowa County, on the Iowa River, and on the Chicago, Rock Island and Pacific Railroad, about 85 miles east by north of Des Moines. It is in a fertile agricultural and stock-raising locality. The chief manufactures are dairy products, agricultural implements and flour. It has banks and three newspapers. It is the trade centre for a large part of Iowa County. Pop. 2,037.

MARENGO, mä-rĕng'gō, Italy, a northern village, near the Bormida, three miles southeast of Alessandria. Its name is connected with the defeat of the Austrians by Napoleon 14 June 1800. The Austrians under Melas were at first successful, but French reinforcements arriving, the cavalry charge of the younger Kellermann turned what looked like certain defeat into a decisive victory. The forces engaged were 33,000 French and 30,500 Austrians; the French loss is variously stated as totaling in killed and wounded 4,000 to 7,000, the Austrians 9,000 to 10,000.

MAREOTIS, mä-rē-ō'tĭs, or **MARIUT,** mä-rē-oot', Egypt, a lake separated from the Mediterranean on the west by the long narrow belt on which Alexandria stands and communicating on the north with Lake Madieh. It is the most westerly of the lakes in the Nile Delta. In the southwest it terminates in a long narrow creek; the main expanse is about 28 miles long by 20 broad. It was at one time deep enough for inland navigation, and had its shores covered with beautiful gardens and vineyards; but having been cut off from the Nile, which supplied its water, it became dry and its area was cultivated. During the siege of Alexandria in 1801 the British let the sea into it, and it now yields much salt by evaporation.

MARE'S TAIL, a genus (*Hippuris*), of plants with whorled narrow leaves and small inconspicuous flowers set in their axils. They are aquatic or marsh plants. *H. vulgaris* is very common in Europe and in some parts of North America.

MARETZEK, mä'rē tsĕk, **Max,** American musician: b. Brunn, Austria, 28 Jan. 1821; d. Pleasant Plains, Staten Island, 14 May 1887. He was educated at the University of Vienna, but desirous of a wider field went to London and was connected for a time with its Italian Opera as chorus-master, writing in addition some music. In 1848 he came to New York, where he was appointed leader of the orchestra at the Italian Opera and subsequently at the Astor Place Theatre and the Grand Opera House. He wrote the operas of 'Hamlet,' 'Sleepy Hollow,' and an interesting book on contemporary life entitled 'Crotchets and Quavers' (1858). Under his management many notable operas and artists, among the latter Adelina Patti and Pauline Lucca, were presented to American audiences.

MAREY, mą'rā, **Etienne Jules,** French physiologist: b. Beaune, Côte-d'ar, 1830; d. 1904. In 1850 he removed to the capital and took his degree in medicine there in 1860. In the same year he began his connection with the physiological department of the Collège de France; founded a physiological laboratory in 1864 and in 1867 became adjunct professor of physiology there. In 1872 he was elected member of the Academy of Medicine and of the Institute six years later. He made important investigations on the physiology of circulation and the heart, on the action of poisons, on animal heat, motion in animals, etc. He invented the

sphygmograph in 1863. In addition to numerous treatises concerning his physiological investigations he published 'Physiologie medicale de la circulation du sang' (1860-64); 'Physiologie du système circulaire' (1866); 'La methods graphique dans les sciences experimentales' (1878); 'Developpement de la methode graphique par l'emploi de la photographie' (1885); 'Physiologie du mouvement: le vol des oiseaux' (1890); 'Le mouvement' (1894).

MARFORIO, mär-fō'rĭ-ō, the popular name of a colossal statue representing the river Rhine, or Danube, or river god, standing in the court of a wing of the Capitol at Rome. The name Marforio is a corruption of *Martis forum* (the forum of Mars), in the entrance of which the statue originally stood.

MARGARET, Saint, queen of Scotland, elder sister of Edgar Ætheling, and granddaughter of Edmund Ironside: b. Hungary, about 1045; d. Edinburgh, 16 Nov. 1093. Shortly after William the Conqueror had established himself on the English throne she and her brother Edgar went to Scotland and placed themselves under the protection of Malcolm Canmore, the Scottish king, who in 1070 became her husband. She was characterized by great devotion to the Church, and it was largely through her influence with the king that the Scottish Church was brought into conformity with those of England and the Continent. She is said, moreover, to have elevated the manners of the Scottish court, and introduced great improvements in needle-work, embroidery and other similar arts. In her personal life, and the great care with which she educated her children, she set a noble example to the people of the somewhat rude and uncultured kingdom. In 1250 she was canonized. Her daughter Matilda married the English king, Henry I, and thus the old Anglo-Saxon line became united with that of the usurping Normans. There is an ancient life of Saint Margaret, written in Latin, it is commonly believed by her confessor, Turgot, bishop of Saint Andrews. The Bodleian Library at Oxford contains a copy of the Gospels which once belonged to her.

MARGARET, queen of Denmark, Norway and Sweden, daughter of Waldemar III, king of Denmark: b. Copenhagen, 1353; d. 29 Oct. 1412. She was married to Hakon, king of Norway, in 1363, and the death of her husband in 1380 placed Norway in her hands; that of her son Olaf in 1387 enabled her to secure the throne of Denmark, to which she had previously brought about his election; and after defeating Albert, the Swedish king, she also obtained possession of the throne of Sweden. She endeavored to place the union of the three kingdoms on a permanent basis by the celebrated Act of Union, or Treaty of Calmar (1397). She died after having raised herself to a degree of power then unequaled in Europe from the time of Charlemagne. She is sometimes styled "The Semiramis of the North."

MARGARET OF ANJOU, ăn'joo, or ăn-zhoo, queen consort of Henry VI of England: b. probably at Pont-à-Mousson, Lorraine, 23 March 1430; d. near Saumur in Anjou, 15 Aug. 1482. She was the daughter of René the Good, of Anjou, titular king of Naples, and was married to Henry in 1445. The imbecility of the king made her practically regent, and her power being contested by the Duke of York, a claimant of the throne by an older line, the protracted Wars of the Roses began. At first victorious, she was afterward compelled to flee to Scotland, but raising an army in the north, she secured, by the battles of Wakefield (1460) and Saint Albans (1461) the death of York, and the release of the king. Her army, however, was soon afterward annihilated at Towton (1461), and Edward (IV), the son of the late Duke of York, was declared king. She succeeded in obtaining assistance from Louis XI of France, but was once more defeated, and took refuge in that country. Warwick then became embroiled with the young king, and determined to replace Henry on the throne. Edward was in turn obliged to escape to the Continent, but obtaining assistance from the Duke of Burgundy returned and defeated Warwick at Barnet (1471). Margaret, collecting her partisans, fought the battle of Tewkesbury (1471), and was totally defeated. She and her son were made prisoners, and the latter, when led into the presence of the royal victor, was killed. Henry soon after died or was murdered in the Tower, and Margaret remained in prison four years. Louis XI ransomed her for 50,000 crowns. See HENRY VI; ROSES, WARS OF THE.

MARGARET OF AUSTRIA, governor-general of the Netherlands, and daughter of Maximilian I of Austria: b. Brussels, 10 Jan. 1480; d. Mechlin, 1 Dec. 1530. She was educated at the French court; was betrothed to the Dauphin Charles, who married Anne of Brittany; married John, the Spanish Crown-Prince, in 1497; and, after his death in the same year, married Philibert of Savoy in 1501, only to be widowed again in 1504. Three years afterward her father made her regent of the Netherlands, where she ruled with much ability although a bitter enemy of the Reformation. She took a prominent part in the peace of Cambrai in 1529, which is called, because negotiated by her and Louise of Savoy, the "Paix des Dames."

MARGARET OF FLANDERS, Countess of Flanders and Hainault, sometimes called Margaret of Constantinople: b. Valenciennes about 1200; d. Lille, 1279. She was a daughter of Baldwin IX of Flanders and Hainault, who was succeeded by Margaret's older sister, Jeanne. Margaret's husband, Bouchard, was seized and killed by Jeanne, upon whose death Margaret came to the crown in 1244. Her reign was peaceable, save for the quarrels between her children by Bouchard and those by Guillaume of Dampierre.

MARGARET OF NAVARRE, nȧ-vär, or **OF VALOIS,** or **OF FRANCE,** French princess, daughter of Henry II: b. Saint Germain-en-Laye, France, 14 May 1553; d. Paris, 27 March 1615. She married in 1572 Henry of Navarre, afterward Henry IV of France. It was entirely a marriage of policy, and on Henry's accession to the throne their marriage was dissolved by mutual consent. She resided thereafter in Paris where her house became the rendezvous of the learning and fashion of the time. Some very agreeable poems by her are extant and her 'Memoirs' (1842) are extremely curious. See HEPTAMERON, THE.

MARGARET OF PARMA, regent of the Netherlands, a bastard of Charles V of Spain by a Flemish woman: b. Oudenarde, 1522; d. Ortona, 1586. Brought up in Brussels, she was married to Alessandro de Medici in 1536, and in 1538 to Ottavio Farnese, Duke of Parma, to whom she bore the great general, Alexander Farnese. In 1559 Philip II made her stadtholder of the Netherlands. There she sided with Granvella, introduced the Inquisition and provoked the provinces to revolt by her strong, masculine policy. She resigned in 1567 when Alva was sent to the Netherlands.

MARGARET TUDOR, queen of Scotland, wife of James IV and daughter of Henry VII of England: b. Westminster, 29 Nov. 1489; d. Methven Castle, 18 Oct. 1541. She was married to the king of Scotland when 14; bore him three children, of whom two, James, later fifth king of Scotland of that name and father of Mary Stuart, and Margaret, mother of Lord Darnley, survived her: and after the king's death (1514) married Douglas, Earl of Angus, from whom she was divorced in 1527, to marry soon after Henry Stewart, Lord of Methven. By descent from Margaret Tudor her great-grandson, James VI of Scotland, was Elizabeth's successor as James I of England.

MARGARET, or **MARGUERITE OF VALOIS,** väl-wa, queen of Navarre: b. Angoulême, 11 April 1492; d. Paris, 27 March 1549. (Variously known as Margaret of Angoulême, of Alençon and of Navarre). She was the sister of Francis I of France, was brought up at the court of Louis XII, married the Duke of Alençon in 1509, became a widow in 1525 and in 1527 married Henry d'Albret, titular king of Navarre. She never reigned over Navarre, but resided at the French court or kept a court of her own at Nérac and Pau. She was acquainted with the principles of the Protestant reformers, and not only afforded protection to reformed divines, but used her influence with her brother Francis to the same purpose, and was a great patroness of men of letters. In 1533 she published a religious poem, 'Le Miroir de l'Ame Pécheresse,' which incurred the censure of the Sorbonne as heretical. In 1547 a collection of her poems and other pieces was printed under the title of 'Marguerites de la Marguerite des Princesses.' The 'Heptaméron, ou sept Journées de la Reyne de Navarre,' a famous collection of tales long attributed to her, is at present regarded as of composite authorship. She left one child, Jeanne d'Albret; afterward mother of Henry IV. Her letters have been published in modern times. Consult Comtesse d'Haussonville, 'Marguerite de Valois' (1870); Lotheissen, 'Königin Margaret von Navarre' (1885); Freer, 'Life of Marguerite d'Angoulême' (1805).

MARGARET SIDNEY. See LOTHROP, HARRIET MULFORD STONE.

MARGARETTA, The, a British armed schooner, captured by Americans near Machias, Me., 12 June 1775, in the first naval contest of the Revolution. In April 1774 Capt. Ichabod Jones sailed into the harbor of Machias, and there, on account of complications caused by the Boston Port Bill (q.v.), he remained for a year, with his vessel hauled up. When news of the battle of Lexington reached Machias, Jones was loading two sloops, the *Unity* and the *Polly,* for Boston, whither he soon sailed. The whole country was now excited over the Port Bill, and in Boston it had caused much distress.

Jones wished to return to Machias with provisions, of which the people there were in want. Admiral Graves, the British officer in charge of Boston harbor, granted him permission to sail on condition of his bringing back lumber for the use of the British troops, and the admiral ordered the *Margaretta,* a cutter of about 100 tons, carrying about 40 men, to accompany Jones to his destination to see that this condition was fulfilled; also that the American skipper should convey to Boston the stores of an armed vessel lately cast away. Jones is said to have been favorable to the British, whose protection at this time he may have solicited. His two sloops, convoyed by the *Margaretta,* arrived at Machias 2 June 1775; but many of the citizens, declaring that he should carry no lumber to Boston, organized for resistance to the enforcement of Graves' order.

The leader of this opposition was Benjamin Foster, a colonial soldier, who had been present at the capture of Louisburg from the French. A secret meeting was called, and on Saturday, 10 June, men of Machias and neighboring settlements gathered in the woods to consider the advisability of attempting to take the sloops, capture the *Margaretta* and make prisoners of the cutter's officers and crew. Among those that assembled was Jeremiah O'Brien, who, with several brothers, participated in the subsequent capture. During the discussion Foster stepped across a small brook running near and called on all in favor of the attempt to follow. The majority followed him, and then "a unanimous declaration of war" was made.

On Sunday, 11 June, Jones and the principal officers of the *Margaretta* being at church, Foster and others started to take them into custody; but, getting the alarm, they escaped by jumping from the windows — Jones fleeing to the woods, while the British officers returned to the *Margaretta* and weighed anchor, threatening to fire on any who should interfere with Jones' sloops.

In spite of this threat the Americans determined to carry out their purpose. When the enemy was sighted, on Monday, the 12th, Jeremiah O'Brien was chosen to lead the movement, and while he took 40 men on board the *Unity,* Foster, with another party, boarded the *Falmouth Packer,* a schooner lying at hand. The bold defiers of British force had only "a few charges of powder and ball for 20 fowling-pieces or muskets, 13 pitchforks and 10 or 12 axes," the powder and balls being nearly all on O'Brien's vessel. As they approached the *Margaretta* she was ready for action, and her commander, Moore, gave warning that he would fire if they came nearer. O'Brien called upon him to surrender, while Stevens, O'Brien's lieutenant, told Moore to "fire and be damned!" To avoid action, Moore crowded all sail and stood out to sea. But the *Unity* was the better sailer, and as she overhauled them the British opened fire, which the heroes of the "fowling-pieces" returned with effect. The vessels coming together, a short musketry fight ensued. Moore himself threw hand-grenades, but was shot down. The Americans — O'Brien at their head

— boarded the cutter and soon had complete possession of her.

In this plucky exploit one of the American party was killed and four wounded, one mortally. On the *Margaretta* four were killed besides her commander, who died of his wound. Her captors triumphantly took the *Margaretta* to Machias the same day, and her crew were held until July as prisoners of war. So ended "one of the most bold, energetic and extraordinary occurrences of the times." With the armament of the *Margaretta* — four 3-pounders and 14 swivels — the *Unity* was fitted out, and she was thenceforth called the *Machias Liberty*.

MARGARIC ACID, or **HEPTADECOIC ACID**, a name now applied to an acid having the formula $C_{17}H_{34}O_2$, which is said to occur in adipocere (q.v.), and which may also be prepared by boiling cetyl cyanide in alcoholic potash.

MARGARIN, or **MARGARINE**, a fatty substance, obtained from lard and from certain vegetable oils. It was formerly believed to be a distinct fat or compound of glycerin with "margaric acid" (q.v.); but it is now known to be merely a mixture of stearin and palmitin. See OLEOMARGARINE.

MARGARIT, or MARGUERIT, Berenger, a Spanish general, who lived in the 12th century. In command of a fleet he was sent by William II, king of Sicily, to succor Tyre, besieged by Saladin in 1188. Margarit, with a fire-ship, burned several of the enemy's ships, while Conrad, governor of Tyre, made a sortie. Attacked on both sides at once, Saladin only just managed to find shelter on an undamaged ship, and escaped. The brilliant conduct of Margarit on this occasion gained for him from Saladin the names of King of the Sea and the New Neptune.

MARGARIT, or MARGUERIT, John, a Spanish cardinal: b. Gerona, 1415; d. Rome, 1484. Successively bishop of Elne, of Gerona and of Patti (Sicily), he received several important missions under Alphonse V, and became Ambassador to Rome under John II, who appointed him chancellor of Aragon. He quelled the troubles which were disturbing Catalonia, and received the cardinal's hat in 1483. He was the author of 'Paralipomenon Hispaniæ' (Granada 1545), a history of Spain from the fabulous arrival of Hercules in the Peninsula, to the reign of Theodosius the Great.

MARGARIT, or MARGUERIT, Peter, a Spanish navigator who lived at the end of the 15th century. He was the nephew of Cardinal Margarit, and left the court of Ferdinand V in 1492 to embark with the fleet of Christopher Columbus, from whom he separated after some dissensions. According to Blasius he discovered the Marguerite Islands, and gave to them his name. Other authors aver these islands were named after the pearls which are found on their shores.

MARGARITA, mär-gä-rē'tä, Venezuela, an island off the northeast coast, in the Caribbean Sea, about 35 miles north of Cumana. In 1901 it was made a province and is known by the name of Nueva Esparta. Its area is 450 square miles. This island was discovered by Columbus in 1498; it was settled by the Spanish about 1525. The name Margarita, meaning "pearl," was given to it because of the pearl fisheries still existing in surrounding waters.

The surface is broken by two mountain chains, the highest point, peak of Macanao, being 4,484 feet. Near the centre is a lagoon, surrounded by low land. Much of the soil is fertile, but the chief industries are fishing, preparing salt for market and cattle-raising. The capital of the province is Asunción; the chief port Pampatar. The inhabitants are nearly all Indians who have long been civilized. Pop. about 40,000.

MARGARITE, or PEARL MICA, a native hydrous silicate of aluminum and calcium, having the formula $H_2CaAl_4Si_2O_{12}$, and usually occurring in laminated forms, like mica. Its crystals, when they occur, belong to the monoclinic system. Margarite is translucent or subtranslucent, with a vitreous or pearly lustre. It occurs in various colors, but predominantly in gray, with perhaps a pinkish tint. It has a hardness of from 3.5 to 4.5, and a specific gravity of about 3. Margarite usually occurs in connection with emery or corundum, from which it is obviously often derived.

MARGARITONE, Italian painter, architect and sculptor: b. Arezzo, about 1219; d. 1289. Called MARGARITONE D'AREZZO after his native place, he attained the first rank as an artist of the Greek school, and was held in high esteem by Pope Urban IV. Jealousy at the success of Cimabue is said to have shortened his days. He painted a great number of frescoes, none of which now exist. Among the few remaining pictures from his brush are Saint Francis in the museum at Siena; a Madonna in the church of Saint Francis at Arezzo; Christ, in the church of San Croce at Florence; the Eternal Father with the angels in the church of Saint Bernardin at Perugia. Painting and sculpture are mingled in his tomb of Pope Gregory X at Arezzo; his sculptured works are chiefly of wood. Among his architectural works are the cathedral of his native city and the governor's palace at Ancona.

MARGATE, mär'gāt, England, a seaport and popular summer watering resort of Londoners, in Kent, in the Isle of Thanet division, 64 miles by rail east of London. The restored parish church of Saint John the Baptist dates from 1050. It was originally a fishing village, but began to develop as a resort about the year 1800. Margate is patronized annually by about 200,000 visitors. Its sea-walks are continuous with those of Westgate and Broadstairs.

MARGATE-FISH, a handsome, pearly white, brown-striped fish (*Hæmulon album*) of West Indian waters, important as a food-fish, and ordinarily weighing about five pounds. It is caught about rocky reefs, in deep water, where it spawns in summer; and at night it comes in shore to obtain the small animals which swarm in the shallows. It is called jallao by Spanish-speaking fishermen, and market-fish, margaret-grunt, etc., by the English-speaking fishermen of Key West and the Bahamas.

MARGAY, mär'gā, a small, yellowish, profusely and beautifully spotted cat of the American tropical forests (*Felis tigrina*), also known in one of its varieties as "chati."

MARGHERITA, mär-gä-rē'tä, queen dowager of Italy: b. Turin, 20 Nov. 1851. She is

the daughter of Ferdinand, Duke of Genoa. In 1868 she was married to Humbert, then crown prince of Italy, who ascended the throne of Italy in 1878. In that same year an attempt was made upon the life of the king, and the nervous shock to the queen seriously affected her health for a number of years. Her winning personality and dignified performance of her duty as queen gained her wide popularity in Italy. In 1900 her husband was assassinated and their son, Victor Emmanuel III, succeeded him as king.

MARGHERITA PUSTERLA, for many years the most popular historical novel in Italy with the exception of Manzoni's masterpiece, 'I promessi sposi,' was written between 1833 and 1834 while the author, Cesare Cantù, lay in prison charged with political offenses against the Austrian authorities. Composed under great difficulties, suppressed by the foreign oppressors who felt themselves attacked through this work, the novel was not published till 1838. The theme deals with the period of the Italian despots of the 14th Century,—a period which had already been treated in Tommaso Grossi's 'Marco Visconti' (1834), to which novel Cantù alludes in his own work. The scene is laid in Milan in 1340–41 during the reign of Luchino Visconti. The latter attempts to seduce Margherita, the wife of the rich and noble Franciscolo Pusterla. Rebuffed by her, the tyrant seeks revenge by sending to the scaffold husband, wife and their young son, a mere child, after having had the parents condemned for treason against the state and conspiracy against his life. Vain attempts to save his master and mistress by the devoted young squire, Alpinolo, an effort to deter the vindictive Luchino from his cruel purpose on the part of the good monk Fra Buonvicino (a replica of the famous Fra Cristoforo of 'I promessi sposi'), heighten the interest of this sombre tale. With the exception of the impulsive and engaging Alpinolo, the sardonic court-jester Grillincervello and the saintly Fra Buonvicino, the characterization is mediocre. The book owes its success to the splendid pictures of mediæval life and to the pathos and horror of its situations. The execution of Margherita Pusterla, a powerful but revolting scene, has been much admired. For a historian of no mean ability, Cantù, as has been justly pointed out by Mazzoni, makes curious blunders and takes singular liberties with his sources. Written when Romanticism was supreme in Italy, 'Margherita Pusterla' is an imitation of 'I promessi sposi' combined with an attempt to rival the vast panoramas, the highly colored realism and the violent contrasts of 'Notre-Dame de Paris.' Consult De Sanctis, Francesco, 'La letteratura italiana del secolo XIX' (Naples 1902); and Mazzoni, Guido, 'L'Ottocento' (Milan 1913).

ALFRED G. PANARONI.

MARGOLIOUTH, mär-gō'lĭ-oot, **David Samuel,** English Arabic scholar: b. London, 17 Oct. 1858. He was educated at Winchester and Oxford and has been professor of Arabic at Oxford from 1889. Among his published works are 'Analecta Orientalia at Poeticam Aristoteleam' (1888); 'Chrestomathia Baidwiana' (1894); 'Letters of Abul 'Ala' (1898); 'Lines of Defence of the Biblical Revelation' (1900); 'Religions of Bible Lands' (1902).

MARGOLIS, Max Leopold, American Hebrew philologist: b. Merech, Vilna, Russia, 15 Oct. 1866. In 1889 he was graduated at the Leibniz Gymnasium, Berlin, and in 1890 received the degree of A.M. at Columbia University and the degree of Ph.D. the following year. In 1892 Dr. Margolis was lecturer on Jewish literature at the Glenmore School for Culture Sciences, Keene, N. Y. From 1892 to 1897 he was connected with the Hebrew Union College, Cincinnati, as assistant professor of Hebrew and Biblical exegesis. In 1897 he became professor of Semitic languages and literatures at the University of California, where he was associate professor from 1898 to 1905. In 1905–07 he held the chair of Biblical exegesis at Hebrew Union College. In 1907–08 Dr. Margolis visited European libraries and in the following year was editor-in-chief of Bible translation for the Jewish Publication Society of America. Since 1909 he has been professor of Biblical philology at the Dropsie College for Hebrew and Cognate Learning, Philadelphia. He is the author of 'Commentarius Isaacidis quatenus ad textum talmudicum investigandum adhiberi possit tractatu Erubhin ostenditur' (1891); 'The Columbia College Manuscript of Meghilla' (1892); 'An Elementary Text-Book of Hebrew Accidence' (1893); 'The Theological Aspect of Reformed Judaism' (1904); 'The Holy Scriptures with Commentary on Micah' (1908); 'A Manual of the Aramaic Language of the Babylonian Talmud' (1910); 'The Story of Bible Translations' (1917) and contributions to philological and theological publications. Since 1914 Dr. Margolis has served as chairman of the editorial committee of the *Journal of Biblical Literature.*

MARGRAVE (German, *Markgraf*), in mediæval times, in continental Europe, a border count or commander entrusted with the protection of a *mark,* or district on the frontier. As early as the times of Charlemagne marks and margraves appear. The margraves stood immediately under the German kings and emperors. In the 12th century margraviates became hereditary and at last the margraves acquired the rank of princes of the empire, between counts and dukes.

MARGRY, mär'grē', **Pierre,** French historian: b. Paris, 1818; d. 1894. He received the appointment of adjunct curator of archives in the Ministry of Marine. He was, in 1842, appointed to study the history of the French in America. The result of his labors was included in several volumes, including 'La navigation du Mississippi et les précurseurs de Fulton aux Etats-Unis' (1859); 'Les Normands dans les vallées de l'Ohio et du Mississippi' (1860); 'Les navigateurs français et la révolution maritime du XIVème au XVIème siècle' (1867); 'Relations et mémoires pour servir à l'histoire de la France dans les pays d'outre mer' (1867); 'Les seigneurs de la Martiniques' (1879); 'Découvertes et établissements des Français dans l'Amérique septentrionale' (1879–88); 'Le conquérant des iles Canaries' (1880). Margry also was editor of 'Les souvenirs d'un homme de lettres' (1877).

MARGUERITE, mär'gĕ-rēt, a popular name for several flowers of the family *Asteraceæ.* The blue marguerite (*Felicia amelloides*),

or blue daisy, is a native of southern Africa, and has long been popular in greenhouses and window gardens because of its simple culture and large solitary flower-heads. The Paris daisy or marguerite (*Chrysanthemum frutescens*), a native of the Canary Islands, was introduced into cultivation in Great Britain about the close of the 18th century and has continued a popular florist's flower ever since. It is the one usually obtainable throughout the year in the stores, but especially during the winter. Because of a close resemblance, the name is applied to its near relative, the ox-eye daisy (*C. leucanthemum*), which is common in mismanaged pastures and fields, especially in the New England and adjacent States. The Reine marguerite (*Callistephus hortensis*) is better known in America as China aster (see ASTER) and is one of the most popular out-of-door annuals of the garden, being easily grown from seed and readily adaptable to any garden soil. The English daisy (*Bellis perennis*) is also called marguerite, but less frequently. See DAISY.

MARIA CHRISTINA, ma-rē'ā krĭs-tē'nā, queen of Spain: b. Naples, 27 April 1806; d. Havre, France, 22 Aug. 1878. She was a daughter of Francis I, king of the Two Sicilies, and was married to Ferdinand VII of Spain in 1829. Upon Ferdinand's death in 1833, Maria Christina by her husband's will became regent until her daughter, Queen Isabella, should become 18. A civil war which was waged until 1840 ensued, its purpose being to place Don Carlos on the throne, and its outcome was for a long period doubtful, but the queen-regent appeared to care only for her chamberlain, Don Fernando Muñoz, with whom she secretly contracted a morganatic marriage. Her policy as regent was entirely subject to the will of the minister of the day which naturally resulted in a reign alternately liberal and despotic. When she affixed her signature to the law concerning the Ayuntamientos the public protested so strongly that she was obliged to resign the regency to the Prime Minister, Espartero, in 1840. In 1843, after the fall of Espartero, she returned to Madrid and in 1844 publicly married Muñoz, who was made Duke of Rianzares. A revolution in 1854 compelled her to flee the country and her return to Spain in 1864 was followed by the revolution which dethroned Queen Isabella in 1868 and she was again exiled and though allowed to return to Madrid after the accession of Alfonso XII, she died in exile.

MARIA CHRISTINA, queen of Spain: b. Austria, 21 July 1858. She was an Austrian archduchess, daughter of Archduke Karl Ferdinand of Austria, and was married by proxy to Alfonso XII of Spain in 1879. At the death of Alfonso XII in 1885, she was appointed queen-regent during the minority of her daughter, Queen Mercedes, who was succeeded six months later by Alfonso XIII, a posthumous son. The queen-regent faced a difficult problem; she was a foreigner, the people were unsympathetic, and the political and financial condition of the country was in a precarious state. She formed a new cabinet with Sagasta, the Liberal leader at its head, and soon won the hearts of her people by her wise and able rule. Throughout the time of her regency she commanded the respect and admiration of the world as well as her own country for her clear, far-sighted administration of the affairs of state and her careful training of the young king whom she endeavored to inspire with her own high sense of the responsibilities of his position. Even the disastrous outcome of the Spanish-American War failed to unsettle the stability of her government which on 17 May 1902 she surrendered into the hands of her son, Alfonso XIII.

MARIA II DA GLORIA, dä glō'rē-ä, queen of Portugal: b. Rio de Janeiro, 4 April 1819; d. Lisbon, 15 Nov. 1853. She was a daughter of Dom Pedro I of Brazil and on the death of her grandfather, John VI of Portugal in 1826, her father ceded to her the succession to the throne. Her uncle, Dom Miguel, to whom she was betrothed was appointed regent, but in 1828 upon the sailing of the young queen for Spain he usurped the throne and barred the landing of the queen. In 1832–33 Dom Pedro instigated a civil war against his brother and, through the intervention of England and France, Maria was placed on the throne in 1834. She married Duke Ferdinand of Saxe-Coburg and though retaining her throne had a troubled and rather unsuccessful reign. Upon her death her son, Pedro V, ascended the throne.

MARIA LESZCZYNSKA, lĕs-chĭn'skä, queen of France: b. Breslau, 23 June 1703; d. Versailles, 24 June 1768. She was a daughter of Stanislas Leszczynska, king of Poland, and shared the obscurity which followed upon his exile. Her marriage to Louis XV in 1725 was arranged by the regent Duc de Bourbon and the minister Fleury and was regarded as an intrigue to further their interests since it antagonized Spain by sending back the young infanta with whom an alliance had been projected. The queen after a brief period in which she tried to control state matters lived very quietly and was noted for her charities. Consult d'Armaille, 'La Reine Marie Leszczynska' (1870); Des Reaux, 'Le Roi Stanislas et Marie Leszczynska.'

MARIA LOUISA, loo-ē'zä, second wife of Napoleon I: b. 12 Dec. 1791; d. Vienna, 17 Dec. 1847. She was the eldest daughter of the Emperor Francis I of Austria and Maria Theresa, daughter of Ferdinand, king of Naples. Her marriage with Napoleon in 1810, after his divorce from Josephine, seemed to promise permanency to his dynasty and peace to the Continent, and her progress toward Paris through the different provinces of the kingdom was carried out like a triumph. In 1811 she bore him a son, to whom was given the title of king of Rome. In 1813, during Napoleon's absence at the war, he named her regent of the kingdom. After his overthrow she returned to Vienna, and remained there during the Hundred Days. In 1816 she received, with the title of Imperial Majesty, the duchies of Parma, Piacenza and Guastalla, and at a later period made a morganatic marriage with her chamberlain, Count Neipperg. Upon his dying in 1829, she took another chamberlain, Count Bombelles, and in 1833 secretly married him. She governed her duchies generally with mildness, but the latter part of her reign was much disturbed by revolutionary outbreaks and the very violent means taken to repress them.

MARIA LOUISA, Order of. See ORDERS AND DECORATIONS OF HONOR.

MARIA MAGDELENA, by C. F. Hebbel: 'Maria Magdelena,' which Hebbel called a "tragedy of common life," is more important as the forerunner of the peasant tragedies of Ibsen and Hauptmann than for any outstanding virtue of its own. It lacks the grandeur, the large stage and large feeling, which give their special quality to 'Herod and Mariamne'; 'Judith' and 'Gyges and his Ring.' It exaggerates the asides and the soliloquies whose dramatic fitness Hebbel defended; it cannot pass the final test of tragedy, which is inevitability. And yet it is the work of a master-dramatist, and the history of realistic drama is not complete which does not include it. For it is one of the first dramas in which the tragedy is centred, not upon a situation but upon the character of a group; in which the conflict is not between the rights of the classes, but between individuals in a family for their personal rights as against "the cruelest of tyrants, the commonplace man in the home circle." It has been called a "tragedy of the fallen woman," and, as such, its weaknesses are apparent. But it is not that. The name of the play is peculiarly unsuitable. It is the tragedy of narrow vision, the tragedy of that fear of what people will say which actuates the life of Master Anton, of Clara, his daughter, and Carl his son, and of their friends and neighbors. 'Maria Magdelena,' was one of the most popular of Hebbel's creations, and is still played in the repertory theatres, 70 years after its writing

EDITH J. R. ISAACS.

MARIA PIA, queen of Portugal: b. Turin, 1847; d. Italy, 1911. Her father was Victor Emmanuel II of Italy. At the age of 15 she was married to Luiz I, king of Portugal. She became dowager queen on 9 Oct. 1889, when her son, Carlos I, ascended the Portuguese throne. The latter and his son, Crown Prince Luiz, were assassinated in Lisbon 1 Feb. 1908, and the aged Maria Pia saw her grandson, Manuel II (q.v.), ascend the throne. Maria Pia devoted herself to charitable work and took no part in the public life of the nation. When the republic was proclaimed in 1910 she fled to Italy and sought refuge with her sister, Princess Clotilda.

MARIA THERESA, tē-rē'sa (Ger. tā-rā'zä), German empress, queen of Hungary and Bohemia, Archduchess of Austria: b. Vienna, 13 May 1717; d. there, 29 Nov. 1780. The oldest daughter of the Emperor Charles VI, she was carefully educated, was named heir to the throne by the Pragmatic Sanction, and in 1736 married Stephen, Duke of Lorraine, who became Grand-Duke of Tuscany in the next year, and who in November 1740, a month after Maria's accession to the throne of Hungary, Austria and Bohemia, was named joint regent with her. France and Bavaria invaded Bohemia; and at the same time she was beset by Frederick the Great in Silesia, by Spain and Naples in Italy, and by the counterclaims of Charles Albert, who was proclaimed first Archduke of Austria and then German emperor. She fled from Vienna to Presburg, convoked the Diet, raised a Hungarian army, won the alliance of England, made a secret peace with Prussia, surrendering Silesia and Glatz, and gained peace by the Treaty of Aix-la-Chapelle, October 1748, securing the election of her husband as German emperor in return for the cession to Spain of Parma, Piacenza and Guastalla. To revenge herself on Frederick she formed an alliance with Russia, and, by the help of her chancellor, Kaunitz, with France. With the further help of Sweden and Saxony she was preparing to strike at Prussia, when Frederick forestalled her by striking the first blow and opening the Seven Years' War (q.v.). This terrible struggle availed Austria nothing and Maria Theresa had to admit Prussia's right to Silesia in the Peace of Hubertsburg 15 Feb. 1763. Francis I, her husband, died 18 Aug. 1765, and Maria associated with her as emperor her oldest son, Joseph II, but kept in her own hands everything save military administration. Seven years afterward, upon the first partition of Poland, she received Galicia and Ludomeria; and in 1775 Bukovina was granted to Austria by Turkey. The Peace of Teschen, closing the War of the Bavarian Succession, brought Austria the Inn Valley in 1779; but the Princes' League (Fürstenbund), under the lead of Frederick II, struck a heavy blow at Austrian supremacy. Though best known for her part in European politics, Maria Theresa was equally great in interior administration; Austrian finance was revived, agriculture encouraged and higher education fostered. The empress was a strict Catholic and an enemy of the Protestant Reformation, but in this latter part of her reign under the influence of her free-thinking son's policies, she was induced to enact some anti-ecclesiastical legislation, which he subsequently developed into persecutions. She was a pure and noble woman, strikingly beautiful in her youth. Ten of her 16 children survived her. Monuments to Maria Theresa are to be found in Klagenfurt, Vienna and Presburg. Her letters to her children and her friends were edited by Arneth (1881), who wrote 'Maria Theresa' (1888). Consult also de Broglie, 'Marie Thérèse' (1888); de Villermont, 'Marie Thérèse' (1895); Wolf and Zwiedineck-Südenhorst, 'Oesterreich unter Maria Theresa' (1884); Bright, 'Maria Theresa' (1897).

MARIA THERESA, Order of. See ORDERS AND DECORATIONS.

MARIAMNE, mā-rī-ăm'nē, granddaughter of Aristobulus and Hyrcanus, the high-priest, and wife of Herod the Great. Her history is related by Josephus from whom we learn that Herod was devotedly attached to her. She was condemned to death through the machinations of Salome, her husband's sister, on a false charge of adultery, 28 B.C. She met her fate with an intrepidity worthy of her noble ancestry, and was bitterly deplored by the king after her decease. Several plays have been based on the story.

MARIANA, Juan, hoo-ān' mā-rē-ā'nä, Spanish historian: b. Talavera, 1536; d. Madrid, 17 Feb. 1623. Taking holy orders he entered the Society of Jesus. To his training at the University of Alcala he owes the pure taste and eloquence of his writings. He taught theology for 13 years with distinction in Rome, Sicily and Paris, returning to the Jesuits' College at Toledo in 1574, where he wrote his 'Historia de Rebus Hispaniæ' (1st ed., Toledo, 1592), in elegant Latin, but afterward translated it into Castilian. His tone is impartial, though he

loves Spain and admires Spanish virtue. Though a Jesuit he complains of Pope Alexander VI. Though a Spaniard he is not blindly prejudiced in favor of his king. He describes with sorrow the conquest of Naples; and his censure of Ferdinand is moderated only by considering his good qualities as personal, his bad ones as common to all princes. He has not, however, much claim to originality and borrows largely from Zurita (q.v.). Four editions of the translation appeared during his lifetime, each with corrections and additions. An English translation was made by Stephens, the continuator of Dugdale's 'Monasticon' (London 1609, folio).

MARIANA, mä-rē-ä'na, in American colonial history, a name given by John Mason to the tract or territory granted to him between the Salem River and the Merrimac. Here he founded an agricultural settlement and formed the Laconia company in 1629. Mason returned to England in 1633 and died there two years later. In 1691 his heirs sold all his lands and rights in New Hampshire to Governor Allen.

MARIANA (mä-rē-ä'nä), or **MARIANNE ISLANDS.** See LADRONE ISLANDS.

MARIANNA, mā-rī-ăn'ą, Ark., town, county-seat of Lee County, on L'Anguille River, at the head of navigation, and on the Saint Louis, Iron Mountain and Southern railroad, about 25 miles north-northwest of Helena. It is in a fertile agricultural region in which cotton is one of the principal crops and in the vicinity are large forests. The chief industrial establishments are lumber-mills, cotton-gins, cotton-compresses and cottonseed-oil mills. The town is at the head of navigation and has considerable trade by steamers and railroad. The town owns and operates the waterworks. There are banks and newspapers. Pop. 4,810.

MARIAZELL, mä-rē-ä-tsĕl', Austria, a picturesque mountain village in the north of Styria, near the Salza, 60 miles southwest of Vienna. It is a noted pilgrim resort, annually visited by about 200,000 persons, attracted by the celebrated image of the Virgin and Child, enshrined in a handsome church founded in 1363, and rebuilt in 1827. Pop. about 1,500.

MARIBOIS. See NAGRANDIANS.

MARIBOJOC, mä-rē-bō-hŏk', a pueblo of the province of Bohol, situated on the southwestern coast on Maribojoc Bay, eight miles north of Tagbilaran, two miles from the mouth of the Abalán River. It is an important road centre. Pop. 10,900.

MARICOPA, mä-rē-kō'pä, or **COCOMARICOPA**, an Arizona tribe of Indians, a branch of the Yumans, formerly inhabiting the region around the confluence of the Gila and Colorado rivers. Their descendants and the Pimas, with whom they subsequently confederated, are now to be found in the Gila River Reservation to the number of about 400. In their aboriginal state their dress was of the scantiest description, and their dwellings and storehouses were of woven straw and cornstalks over a pole framework. They were an agricultural people and raised large crops by irrigation. Under missionary influence they have been civilized and are now noted for their industry, their efforts at self-improvement and their manufactures of cotton cloth, baskets and pottery.

MARIE ANTOINETTE, mär'ĭ ăn-toi-nĕt' (Fr. mä-rē ăṅ-twä-nĕt), queen of France: b. Vienna, Austria, 2 Nov. 1755; d. Paris, 16 Oct. 1793. She was the daughter of the Emperor Francis I and the celebrated Maria Theresa. She left Vienna for Versailles in 1770, when only 15, to marry the young Duc de Berri, afterward Louis XVI of France. When her husband ascended the throne in 1774, she gained the affections of the people by repeated acts of generosity. It was, however, soon observed that her natural freedom of manner brought on her the criticism of enemies about the court. It was thought, too, as many believe, with reason, that she was to a certain extent controlled by her mother as an Austrian spy. An extraordinary occurrence added fresh force to calumny and tarnished the fair name of the queen, who was not to blame. This was the affair of the "Diamond Necklace," in which the Cardinal Louis de Rohan, the magician Cagliostro and the Countess de Lamotte were the chief actors. It was certain that Marie Antoinette had great influence over the king, and that she constantly opposed such measures of reform and economy as had been proposed. Her extravagance was regarded by the people as one of the chief causes of their poverty. Her unpopularity increased, and the general indignation was raised to the highest pitch by the enthusiastic reception given her at the banquet on 1 Oct. 1789, where the white Bourbon cockades were worn and the national cockade trampled under foot. The insurrection of women, the attack on Versailles and the transfer of the royal family to Paris followed in a few days. It was the queen who advised the flight of the royal family from Paris to join Bouille's army in June 1791, which ended in their capture at Varennes. From that time they were viewed as traitors. On 10 Aug. 1792, the last day of the royalty, the queen exerted all her power to induce the king to resistance. This he thought was vain, and he was led with his consort before the Legislative Assembly. She heard his deposition announced, and then accompanied him to the prison of the Temple. There, deprived of every semblance of royalty, she displayed magnanimity and patient endurance. In August 1793, she was removed to the Conciergerie, and in October was brought before the revolutionary tribunal. She was charged with having dissipated the finances, exhausted the public treasury, corresponded with foreign enemies of France and favored its domestic foes. She replied with firmness and decision, and heard her sentence pronounced with perfect calmness. On the same day she was guillotined. Marie Antoinette's faults were due in great measure to her defective education and difficult position. Her expiation of them made her a general object of pitying interest. Consult Lescure, 'La vraie Marie Antoinette' (1863); Campan, 'The Private Life of Marie Antoinette' (1887); Bicknell, 'The Story of Marie Antoinette' (1897); Belloc, H., 'Marie Antoinette' (1909); Heidenstam, O. G., 'Marie Antoinette, Ferson et Bernave: leur Correspondance' (Paris 1913).

MARIE DE FRANCE, mä-rē dė frāṅs, French poetess of the 12th century, a native of Ile-de-France, whence her surname, who spent

her life in England, where she was well known at the court of Henry II. Her 'Lais,' largely based on Breton stories, and full of Celtic spirit and pathos; fables, a revision under the title 'Isopet' (that is, Æsop) of an English collection; and a tale, 'Le Purgatoire de Saint Patrice,' make up the body of her work. The 'Lais' are edited by Warnke (1900), and the 'Purgatoire' by Jenkins (1894); each edition has a valuable preface.

MARIE GALANTE, gȧ-lȧnt, West Indies, an island, one of the Lesser Antilles, belonging to France, about 15 miles southeast from Guadeloupe. The area is about 60 square miles. The chief productions are sugar, coffee, tobacco, indigo and cotton. It is a dependency of Guadeloupe. Columbus discovered it in 1493, and named it from his vessel, the *Santa Marie.* The French occupied it in 1647, and lost it several times. In 1825 it suffered severely from the hurricane which desolated Guadeloupe (q.v.). Pop. 14,268, chiefly negroes.

MARIE DE MÉDICIS, dė mā-dē-ses, queen of France: b. Florence, 26 April 1573; d. Cologne, 3 July 1642. She was the daughter of Francis I, Grand-Duke of Tuscany, and was married by proxy, 5 Oct. 1600, to Henry IV of France, with whom she constantly quarreled, partly because of his inconstancy and his open favor to the Marquise de Verneuil, and partly because of her own haughty, obstinate character, which was not unmixed with ambition. For years she urged him to have her crowned queen; the ceremony took place 13 May 1610, and on the next day the king was assassinated. Marie was accused of complicity in the plot, but the charge is not proven. For seven years she acted as regent and showed a strong friendship for Spain and the Catholic Church, being advised by the nuncio and the Spanish Ambassador as well as by such favorites as the Concinis. She quarreled with her son, later Louis XIII, was reconciled to him by Richelieu, and upon her attempt to displace the latter was forced by that great minister again to leave court in 1630. Her last years were spent in exile in Belgium, England and Cologne. The story of her poverty during these years is untrue. Consult Miss Pardoe, 'Life and Memoirs of Marie de Médici' (1852); Lord, 'The Regency of Marie de Médicis' (1903).

MARIE PAULINE, Princess Borghese. See BORGHESE, MARIE PAULINE.

MARIENBAD, mā-rē'ĕn-bȧd, Austria, one of the most frequented and picturesque of the Bohemian watering-places, near the western frontier, in a triangular basin formed by several mountain ranges, about 32 miles northwest of Pilsen. The village, built on a slope, surrounded with woods of pine and fir trees, except in front, has a town-house with assembly-room and reading-rooms; several bathing establishments, theatre, etc. The springs utilized are eight in number and are cold; some are alkaline and containing Glauber's salts, others alkaline and chalybeate, etc. Seven are used externally and internally, one is used for bathing alone. Great quantities of the water are exported in times of peace. Pop. about 6,500.

MARIETTA, mā-rī-ĕt'ą, Ga., city, county-seat of Cobb County, on the Nashville, Chattanooga and Saint Louis Railroad, about 20 miles north by west of Atlanta. Kenesaw Mountain (q.v.) is west of the city. It was settled about 1840–41 and incorporated in 1852. A city charter was granted in 1885. It is in a fertile agricultural region in which stock-raising is one of the prominent occupations. Large marble quarries are in the vicinity. The chief manufactures are chairs, dressed marble and machine-shop products. The chief buildings are the churches and schools. The Clarke Library, which contains about 5,500 volumes, is in Marietta. A national cemetery located here contains the graves of 10,279 soldiers; the unknown dead number 2,967. The mayor and council are chosen at a popular election. Pop. 5,949.

Marietta was an intermediate objective point in General Sherman's campaign for Atlanta, and when he crossed the Etowah 23 May 1864, his columns were headed for that place by way of Dallas and New Hope Church, but Gen. J. E. Johnston threw his army in his front and checked him at New Hope Church and Dallas. After many hard-fought battles and constant severe skimishing, Johnston abandoned his Dallas lines (see DALLAS, GA., BATTLE LINES AT) on 4 June, and took position covering Marietta, his left on Lost Mountain, his right beyond the railroad and behind Noonday Creek, with a strong advanced position on Pine Mountain. Sherman repaired the railroad, established a secondary, fortified base at Allatoona Pass, and joined by Blair's Seventeenth corps advanced 10 June and confronted Johnson in his new and strong position, and by the 14th was strongly intrenched before it in a continuous line of 10 miles. Johnston abandoned Pine Mountain on the night of the 14th, and Sherman advanced his lines, bringing on the engagement at Pine Mountain (q.v.) 15 June. The general movement was continued on the 16th and the right thrown forward to threaten the railroad below Marietta. On the 18th Johnston fell back to a new line, including Kenesaw Mountain, which was strongly fortified, and Sherman pressed in closely on the centre and left, north of Marietta, still continuing the extension of his line to the right, south of it. Johnston, making a corresponding movement by his left, encountered Sherman's right at Kolb's Farm (q.v.) on the 22d. Sherman assaulted Kenesaw Mountain (q.v.) on the 27th, and was repulsed. Flanking operations were then renewed to the right to reach the railroad, and Johnston, finding it in danger and his communications with Atlanta threatened, after being 26 days under an uninterrupted cannonade and infantry fire, abandoned Marietta on the night of 2 July and fell back to a new line, previously selected and intrenched, 10 miles south of Marietta, and covering the railroad and his pontoon-bridges across the Chattahoochee, with an advanced position at Smyrna Camp-ground. Sherman occupied Marietta on the morning of 3 July. The Union loss in the operations around Marietta was 1,790 killed and missing, and 5,740 wounded, an aggregate of 7,530. Johnston reported a Confederate loss of 468 killed and 3,480 wounded. Consult 'Official Records' (Vol. XXXVIII); Sherman, 'Memoirs' (Vol. II); Van Horne, 'History of the Army of the Cumberland' (Vol. II); Johnston, 'Narrative.'

MARIETTA, Ohio, city, county-seat of Washington County, on the Ohio River at the mouth of the Muskingum, and on the Baltimore and Ohio and Pennsylvania railroads, about 95 miles, in direct line, southeast of Columbus. The city is in a coal, iron, petroleum and gas region with fertile agricultural lands in the valleys. Seven hundred carloads of vegetables and 400 carloads of fruit are shipped from this county annually to other markets. The manufacturing establishments include chair factory, glassworks, oil machinery and tool works, brick plant, foundries, saddle and harness plant, sheet and tin plate mill, five chemical plants, button plant, safe-cabinet works, paint and color plant, automobile devices plant. There are five banks with combined assets of over $8,000,000. The principal buildings are the Marietta College, the public schools, the churches, the county courthouse, the city hall, the post office, the chamber of commerce, the armory, public library, club houses, three office buildings, etc. The government is vested in a mayor and council and is administered according to the "Ohio Municipal Code."

The site of Marietta was once part of a remarkable group of ancient works which consisted of two sections, one containing about 40 acres, the other about 30 acres. The remains of mounds, truncated pyramids, walks, walls and other ancient works still exist, although the city covers a large part of the original enclosures. The first settlement was made in 1788 by people from New England, under Gen. Rufus Putnam, acting for the "Ohio Company" who had secured a grant of lands on both sides of the Muskingum River. The place was named in honor of Marie Antoinette. Arthur Saint Clair organized here July 1788 the Northwest Territory. In 1800, Marietta was incorporated as a town. Fort Harmar, built in 1785, was opposite Marietta, and in 1890 the village of Harmar, once the site of the fort, was annexed to the city. The building used as the land office for the "Ohio Company," the old Block House, and the mansion of the first governor of Ohio, are still standing here and in good condition. The museum contains many things of historic interest. Many of the pioneers of New England as well as of Ohio, and many of the Revolutionary soldiers, were buried in the Marietta cemetery. Pop. approximately, 16,000. The city limits have been extended and several large plants have been established. Consult King, 'History of Ohio'; Hoar, 'Oration at the Celebration of the Centennial of the Founding of the Northwest at Marietta.'

MARIETTA COLLEGE, in Marietta, Ohio, founded in 1835 for men and women. It has college and preparatory departments; the latter is known as Marietta Academy. The courses lead to the degrees of A.B., Ph.B. and B.L. Courses are provided for work in music, art and military science, and short summer schools are given for work in the arts and sciences. The library, which has about 76,000 volumes and 30,000 pamphlets, is noted for its books on the history of the Northwest. In 1917 there were connected with the college 19 instructors and about 225 students. The grounds and buildings were valued at $300,000, the productive funds at $587,000, and the total income $49,384.

MARIETTE, mą'rē'ĕt, **Auguste Edouard,** French Egyptologist: b. Boulogne-sur-Mer, 11 Feb. 1821; d. Cairo, 19 Jan. 1881. He was educated at the Boulogne Municipal College and in 1839 went to England as professor of French and drawing. He returned to France in 1840, took his degree at Douai in 1841 and became professor at his alma mater, the Boulogne Municipal College. While so engaged he became interested in archæology and in 1847 published 'Lettres à M. Bouillet,' an essay on the history of Boulogne. In 1848 he received a position in the Egyptian museum of the Louvre; and in 1850 was sent by the government to gather Coptic, Syriac, Arabic and Ethiopic manuscripts in Egypt. His excavations and discoveries in connection with his search for the true site of Memphis led to the finding of many important remains, such as the Serapeum, the first Memphian temple discovered, near the three great pyramids. Beginning to excavate four miles west of the accepted site of Memphis, Mariette came first upon an avenue of sphinxes, which led directly up to the magnificent granite and alabaster temple of Serapis mentioned by Strabo, which contained the sarcophagi of the sacred bulls of Apis from the 19th dynasty to the Roman supremacy. Besides these he found no less than 2,000 sphinxes, and over 4,000 statues, bas-reliefs and inscriptions, some evidently of Greek construction; and various streets, colonnades, and other structures belonging to a great city. His excavations around the base of the sphinx near Gizeh not only disclosed the entrance to it, but proved it to be sculptured out of the solid rock. In 1854 he returned to Paris and was made assistant conservator of the Louvre; and in 1855 was sent to Berlin to study Egyptian remains in the museums there. On his return to Egypt, in 1858, the viceroy made him conservator of the monuments and antiquities of the land, with the title of bey, later promoted to pasha, with an annual appropriation for the prosecution of his researches, and the foundation and maintenance of the museum of Boulak. His discoveries at Tanis revealed the monuments of the Hyksos dynasty, and those at Thebes explain the chronology of the various dynasties. In 1860 he made the important discovery of the mummy of Queen Aahhotep, of the 18th dynasty, with a wealth of jewels of exquisite workmanship belonging to her. In 1873 the Institute of France awarded him the biennial prize of 20,000 francs. His discoveries have been of utmost importance for the light that they have thrown upon the earliest periods of Egyptian history. His chief published works are 'Mémoire sur la mère d'Apis' (1856); 'Aperçu de l'Histoire d'Egypte' (1864); 'Nouvelle table d'Abydos' (1856), account of a second tablet found in Abydos which supplies the vacancies of the first and gives a list of the kings of the first six dynasties, corroborating that of Maneths; 'Le Sérapéum de Memphis' (1857–64); 'Fouilles exécutées en Egypte, en Nubia, et au Soudan d'après les ordres du vice-roi d'Egypte' (1867); 'Notice des principaux monuments du musée de Boulak' (1870); 'Les Papyrus égyptiens du musée de Boulak' (1871); 'Album du musée de Boulak' (1873); 'Les Mastabas de l'Ancien Empire' (1881–89).

Mariette lies buried in the museum-garden at Boulak, inclosed in an ancient Egyptian sarcophagus. Consult Mariette, Edouard, 'Mariette Pacha' (Paris 1904) and Maspero, G. C. C., 'Notice biographique sur Auguste Mariette' (ib. 1905).

MARIGNOLLI, mä'rēn-yōl'lē, **Giovanni de',** Italian traveler: b. Florence, probably about 1290; date of death unknown, but subsequent to 1357. Entering the priesthood, he was appointed one of the four legates sent by Benedict XII to the great Khan of Cathay in 1338. The four legates accompanied by about 46 followers traveled east via Constantinople, whence in June 1339 they sailed across the Black Sea to Kaffa. They spent the winter of 1339 at Sarai on the Volga, enjoying the hospitality of Mahommed Uzbeg, Khan of the Golden Horde. From his court the party traversed the steppes to Almalig (Kulja), in the modern Ili. They reached Peking via Kamul about June 1342, and were well received by the Khan. The arrival of this embassy is chronicled in Chinese annals. Marignolli remained three or four years in Peking, after which he wandered through eastern China to Amoy Harbor. In 1348 he reached Kaulam (Columbum) in Malabar, where he founded a Latin church. He stayed 18 months there after which he appears to have visited the coast near Madras, thence journeyed to Java, and on a voyage to Europe was wrecked at Bernwala (Pervily), Ceylon, where he was detained four months by the native ruler, Khoja Jahan. Marignolli returned via Armuz, Bagdad, Mosul, Aleppo, Damascus and Jerusalem, arriving at Avignon in 1353 and delivering a letter from the Khan to Pope Innocent VI. In 1354 the emperor, Charles IV, made Marignolli one of his chaplains, and soon afterward he was consecrated bishop of Bisignano. It does not appear, however, that he ever took possession of his see. About 1355 he removed in the retinue of the emperor to Prague and was papal envoy to Florence in 1356. In 1357 he was at Bologna. The last trace of Marignolli is a letter to him from Richard Fitz Ralph, archbishop of Armagh, Ireland, in which the writer objects to the sending of Marignolli as papal envoy to Ireland. In 1768 Marignolli's work appeared in volume II of 'Monumenta historiæ Bohemiæ,' edited by Dobner. Modern readers were first attracted by the account published by J. G. Meinert (1820). Consult Beazley, C. R., 'Dawn of Modern Geography' (Vol. III, 142, 180–181, 184–185, 215, 231, 288–309, 1906).

MARIGOLD, a popular name for several unrelated plants. The pot marigold (*Calendula officinalis*) is one of the most widely popular of garden plants. It is grown for its brilliant flowers which range from white to rich orange, and for its flower-heads, which are often used to flavor soups, stews and dressings. The African marigold (*Tagetes erecta*) and the French marigold (*T. patula*) are also widely used for ornament. Their flowers are usually some shade of yellow, but some are brown and some striped. The Cape marigold (*Dimorphortheca spp.*) is also grown for ornament but is less popular than the above. The corn-marigold (*Chrysanthemum segetum*) is a weed especially common in Europe grain-fields, but also cultivated for its flowers, for which the plant is sometimes forced in greenhouses. All these belong to the family *Asteraceæ*. The marsh marigold (*Caltha palustris*) is a member of the family *Ranunculaceæ*. It is a well-known plant in the marshes and wet meadows of North America. The leaves, gathered before flowering, are widely used as a potherb under the name of "cowslip greens." The name fig marigold is applied to various members of the genus *Mesembryanthemum*, several of which are cultivated for their grotesque forms, their peculiar foliage, etc.

MARIKINA, mär-ī-kē'nạ, a Brazilian name for a marmoset (q.v.).

MARINDUQUE, mä-rēn-doo'kā, Philippines, an island lying southwest of the province of Tayabas, Luzon, and 30 miles southeast of Lipa; it is circular in shape, being 24 miles north and south and 23 miles east and west; area, 667 square miles. A mountain range runs from north to south across the island, and near its centre are short spurs running east and west. The staple products are rice, cocoanuts and hemp; the island is heavily wooded, and fruits are abundant and an important article of food among the natives. The chief industry is the raising of rice, of which large quantities are exported; the hemp of Marinduque is of a peculiar fine quality, and is used for weaving. At the southern end of the island there is excellent pasturage, and horses and cattle are raised. It is in the route of steamers in the local trade between Manila and the Visayan Islands and Mindanao, and its two chief towns are ports of call for these steamers. In the winter of 1898–99 Marinduque was occupied by the United States troops, it being the first important position in the south taken after leaving Verde Passage. In 1901, with the small islands adjacent, it was created a province under civil government; 23 June 1902 the provisions of the Provincial Government Act were extended to the island of Mindoro and the Lubang group by incorporating them with the province of Marinduque. Pop. about 52,000, mostly Tagálogs.

MARINE ANIMAL OILS. See OIL.

MARINE CITY, Mich., city in Saint Clair County, situated on the Saint Clair River and the Rapid Railroad, 45 miles north of Detroit. It enjoys considerable reputation as a summer resort, but is also a busy manufacturing centre with salt works, beet sugar factories and ship yards. The city owns the water-supply system. Pop. 3,770.

MARINE CORPS. See NAVY OF THE UNITED STATES.

MARINE ENGINE. See INTERNAL COMBUSTION ENGINE.

MARINE HOSPITAL SERVICE. See HOSPITALS, MILITARY; HOSPITAL SHIPS.

MARINE INSECTS. Insects have not only invaded rivers and lakes, they have established themselves to some extent at least, along the margin of the sea. On a sunny day by the shore myriads of flies may be seen hovering over the seaweed cast up by the tide. These have been developed from grubs which live and feed in the decaying weed, and are able to bear immersion twice daily. Around the rock-pools many midges may be noticed. Their grubs feed on growing green seaweed, and spend their

whole life in the salt water, breathing the dissolved air, as do their fresh-water relations, by means of gill-filaments, or simply through the surface of the skin. Many species of beetles inhabit the shore, and are submerged twice daily, when they lurk under stones or burrow into the sand; their hairy bodies are not easily wetted, and in one of the best-known marine beetles (*Aëpus*) there are paired air-sacs in the hind-body which are believed to act as reservoirs for breathing while the tide is up. Several kinds of very small springtails may be seen on the surface of the rock-pools at low-tide; probably when the water rises they retire into crevices of the rocks. They are covered with a very fine, dense pile, and it seems impossible to wet them.

The absence of wings is a common character among the sea-shore insects. The beetles of the genus *Aëpus* are wingless, and so is the small bug *Aëpophilus* often found in their company, as well as the female of the midge *Clunio*, whose mate, though winged, appears not to fly, but to use his wings as sails as he skims over the surface of the rock-pools. "The tendency of insects on oceanic isles to lose their wings has often been noticed" says Carpenter, "and the loss of the power of flight explained as an advantage, since insects which do not fly cannot be blown out to sea. Possibly the absence of wings in so many sea-shore insects can be explained in like manner. Several genera of pond-skaters have one or two species which frequent the water of estuaries and harbors; these are in all cases wingless, though their fresh-water relations are, as a rule, winged."

The extreme of adaptation to marine life is shown by the bugs of the genus *Halobates*, also belonging to the family *Hydrometridæ*, with their short anchor-like fore-legs and their immensely long and slender middle and hind-legs, the middle shin and foot being fringed with long hairs. The elongate wingless fore-body of these insects and the greatly reduced hind-body give them a most peculiar and characteristic appearance, and the dense pile wherewith they are clothed keeps them dry. They have been observed gliding over the calm seas of the tropics, often hundreds of miles from land, or clinging to drifting substances whence they could suck food. Consult Carpenter, G. H., 'Insects, their Structure and Life' (1899); Miall, 'Natural History of Aquatic Insects' (1895).

MARINE INSURANCE. See INSURANCE, MARINE.

MARINE SEDIMENTS, those laid down in the ocean, in contrast to terrestrial deposits laid down on land. They are usually characized by uniformity in thickness and character over rather large areas, and commonly contain fossils of animals known to live only in the sea. The common types are conglomerates, sandstones, shales and limestones. See OCEANS, section on *Ocean* in article on GEOLOGY, and section on *Sedimentary Rocks* in article on ROCKS.

MARINER'S COMPASS. See COMPASS, MARINER'S.

MARINES. See MARINES, UNITED STATES.

MARINES, United States.— The oldest branch of the United States military service, inaugurated in 1775. While until recent years the services of this corps did not receive special notice, through recent foreign expeditions their conspicuous bravery under the most trying conditions (Peking, Vera Cruz, etc.) brought them a prominent place in the public eye, a condition reaching its climax during the World War in 1918 (Belleau Wood, etc.). The marines have had numerous soubriquets conferred on them among them might be mentioned "Webfoot soldiers"; "Soldiers of the Sea," while Kipling called them "Soldier and sailor, too." The Hon. Josephus Daniels, Secretary of the Navy, prefers to term them "the efficient fighting, building and landing force of the Navy," which title well defines some of the activities that come within their scope. The Marine Corps is an independent branch of the military service under direction of the Secretary of the Navy. Their home service consists of protecting government property at naval stations and use in national emergencies (riots, insurrection, etc.). Abroad they are the first line of mobile defense of naval bases and stations; they are used for the protection of American lives and interests in foreign countries, besides acting as landing parties with expeditionary forces and on advanced base duties.

United States Marine Corps insignia.

The equipment of the Marine Corps contains at present: Infantry, field artillery, machine-gun companies, fixed defensive artillery, engineers, signal corps, etc. An aviation branch used heavier and lighter than air crafts in efficient service on the Allies western front in 1918. The corps is then a complete army in itself, lacking only cavalry. And on several recent expeditions horses have been brought into play as mounts for some officers. Every man in the ranks obtains a perfect training and practice in marksmanship, and their officers, after the full course at the Annapolis Naval School, which constitutes the naval officers' course, have to pass through two years' vigorous study and drill at the Norfolk School for Marine Corps Officers.

History.— The first record of American marines in this country dates back to 1740 when three regiments were organized in New York for service under the flag of Great Britain. On 10 Nov. 1775 a Marine Corps was organized under a resolution of the Continental Congress with one colonel, two lieutenant-colonels, two majors, etc., to be known as "First and Second Battalions of American Marines." Already by February 1777 a battalion of 300 marines and landsmen, under Maj. Samuel Nichols, captured the English forts of New Providence, Bahamas — United States marines' first battle. Throughout the Revolutionary War the marines did an appreciable share of the fighting which brought victory and freedom in its train. Conspicuously active were they under John Paul Jones, in the battle between the *Ranger* and the *Drake*, Lieutenant Wallingford losing his life commanding his marines. Forty-nine out of 137 marines in the great battle between the *Bon Homme Richard* and the *Serapis* were killed or wounded. The State of Pennsylvania fitted out the *Ryder Ally*

with a crew of 110 seamen and marines with Captain Barney in command, in 1782, which fought the hot combat in Delaware Bay, capturing the British ship *General Monk*, generally looked upon as one of our most brilliant actions. With the Revolution ended, both army and navy were disbanded, the new Navy Department being created April 1798 and the Marine Corps organized and established 11 July of the same year.

The next noteworthy marine engagement was in 1803 in the War with Tripoli when the *Philadelphia's* Lieutenant Osborne and guard were taken prisoners "after the most gallant exertions." It was the marines who rendered such valuable service to General Eaton (q.v.), consul at Tunis, in his remarkable march of about 600 miles across the desert of North Africa, from Alexandria to Derne, on arriving at which latter place native fortifications were stormed and captured by the marines under Lieutenant O'Bannon. They hauled down the Tripolitan flag and hoisted that of the United States of America, this being the first time the American flag *flew on a fortress in the Old World.* "Tripoli" has appeared inscribed on the banners of the Marine Corps ever since. When, in the War with Great Britain (1812), the *Constitution* defeated the *Guerrière,* it was the commander of the marine guard, Lieutenant Bush, who was the first officer killed, while repelling boarders during a critical phase in the action. In the capture of the frigate *Macedonian* by the *United States* (Commodore Decatur) the marines, under Lieutenants Anderson and Edwards, are cited as fighting with "utmost steadiness." Lieutenant Gamble, of the marines, was commended for "skill and efficiency" in commanding in turn his guard, a prize ship and a fort at Nukahiva, Marquesas Islands. In the sanguinary combat between the *Shannon* and the *Chesapeake,* so famous in our history, Lieutenant Brown and 11 of his men were killed and 20 wounded. In the battles of Lake Champlain and Lake Erie the marines actively participated, also in the engagement between the *Constitution* and the *Cyane* and *Levant,* in the combat between the *President* and *Endymion* and in the battle on Lake Ponchartrain. They were with the army under Scott in Canada, with General Winder at Bladensburg, at New Orleans with General Jackson, at North Point, Baltimore, and in minor actions on Maine's coast and the shores of Chesapeake and Delaware bays. The Indian outbreak in Georgia (1836) found the army unprepared and Colonel-Commandant Archibald Henderson, of the marines, quickly volunteered the corps' services, and they fought, under General Jessup, through southern Alabama and the Florida Everglades against the guile of the Creeks and Seminoles. Previous to this they had been engaged against Spanish pirates in the West Indies and in Sumatra, and in the great fire in New York (1835) they had guarded private and public property.

In 1845 Mexico declared war against the United States and (to 1848) the marines were active in all sections, making a brilliant record. They were on the Pacific Coast under Commodores Sloat, Shubrick, Stockton; on the East Coast they fought under Commodores Connor and Perry; on shore under Generals Scott, Taylor and Worth. At the capture of Monterey, San Francisco and Mazatlan they were present, and their action at Los Angeles, San Diego, San José, San Gabriel and Guaymas called forth the complimentary recommendation of Commodore Shubrick that the government should double the force of marines on his station, even if thereby they had to reduce the force of ordinary seamen and landsmen. The captures of Matamoras, Tampico, Frontera, Tabasco, Vera Cruz were aided by marines, and the marines were the first division to enter the Grand Plaza, City of Mexico. Hence the inscription that since is read on the banners of the corps: "From the Shores of Tripoli to the Halls of the Montezumas." But the greatest glory of the marines in this Mexican campaign happened when (13 Sept. 1847) Majors Twiggs and Reynolds, of this corps, were selected to lead a body of men picked from all the different corps to storm the castle of Chapultepec. The brave Twiggs fell early in the advance, but in a hand to hand fierce fight, bayonets crossed, rifles clubbed, the bold assailants gained their objective.

In 1852 and 1853 Commodore Perry had these same heroes, as a part of his expedition to Japan, marching "to the same music" through the streets of Yeddo, when he opened the doors of the Mikado's realm to civilization and commerce. It was the marines who, 100 strong, were dispatched (1859) to Harper's Ferry to capture John Brown and suppress the rebels. They carried out the commission to the satisfaction of the Secretaries of War and Navy. First work of the marines on the outbreak of the Civil War (1861) was in reinforcing the troops at Fort Sumter, at Fort Washington, on the Potomac River, Fort Pickens, Florida, and in destroying the navy yard, ships, etc., at Norfolk, Va. They did their share of fighting at the first battle of Bull Run, in the capture of Hatteras Inlet and in the Dupont expedition as well as in the battle of Port Royal and the expeditions along the coast and rivers of South Carolina, Georgia and Florida. They had an active part in the battle between the *Merrimac* and the *Minnesota, Cumberland, Roanoke* and *Saint Lawrence.* The marines were active in the operations at Roanoke Island, North Carolina Sound, James and Potomac rivers and on the lower Mississippi. They were the first Federals to reoccupy (1862) the Norfolk navy yard, and participated in the night attack on Fort Sumter (1863). as well as in the fight between the *Alabama* and *Kearsarge.* In that same year they were besieging the Simonoseki forts at Japan, and taking a part in the battle of Mobile Bay. The marines were in the attack on Fort Fisher. Lieutenant French, of the marines, and two sergeants were commissioned to arrest and deliver Captain Semmes of the Confederate cruiser *Alabama* and succeeded. In 1867 and 1870 the marines were part of the Formosa expedition against savages, and in 1871 led the advance against the forts in Korea. They were useful during Boston's great fire in 1872 and in the labor riots of 1877. A detachment of marines, in 1882, landed at Alexandria, Egypt, preventing pillage. After numerous minor activities on this continent protecting Americans and property on Nevassa Island (1891), Valparaiso and at Honolulu (1893), Korea and China, etc., we come to the Spanish War when

(1898) Guantanamo, Cuba, was occupied by a detachment of marines and, assisted by the ships, successfully defended the place against 6,000 Spanish soldiers, creating a base for the navy. The marines, at the secondary batteries, are credited with doing more damage to the Spanish cruisers than the other gunners at the battle (3 July 1898) of Santiago, and it was the marines that Dewey in May of that year landed and turned over the occupation of Cavite as fort and naval station after the battle of Manila Bay. In 1900 marines from Manila (later reinforced by marines from the United States) landed in China and did their share in the fighting at Tien Tsin, and on the march to the relief of the besieged American legation at Peking in the Boxer Rebellion. Spectacular was the expedition commanded by Captain Thorpe, in 1903, when, accompanied by a company of marines mounted on camels, they crossed the African deserts into the heart of Abyssinia, as escort of an American representative, and brought about a conference with King Menelik in his capital. In the same year marines were protecting the American legation at Seoul, Korea, where insurrection existed. Four battalions of marines were sent to Cuba in 1906 and, later in conjunction with the army, became the "Army of Cuban Pacification," successfully pacifying the incipient Cuban revolution, with a two-year occupational service. In 1908 the marines were policing at the election polls at Panama, and the next year were protecting American citizens and property against Nicaraguan revolutionists at Corinto, and (1909) in Bluefields, Nicaragua. Back to the same place came the marines in 1912 during another Nicaraguan intense revolutionary spasm; a battalion, under Major Butler, to Corinto, a regiment, under Colonel Pendleton, followed. The regiment fought several engagements but pacified the country, with a loss of four lives and several wounded. A regiment of marines under Colonel Moses, on the *Prairie,* was dispatched to Port au Prince to protect Americans employed as customs collectors, border fighting having taken place between the negro republics Santo Domingo and Haiti. In 1914, under the present major-general commandant, George Barnett, marines landed, 22 April, in Vera Cruz, Mexico, and did their active share in the military occupation of that place. That day and the next they lost five lives and a number were wounded, facing a desperate resistance. They occupied the town till November. Intermittently the marines were doing duty in Santo Domingo or Haiti in the disturbances of the island republics up to 1917.

Marines, Activities in France in 1918 — Belleau Wood, Soissons, etc.— On 30 May 1918, the Second Division of the United States Marines was selected under its commander, Maj.-Gen. Omar Bundy, to go to the relief of the French army in retreat before the German drive. The Fifth and Sixth regiments and the Sixth Machine-Gun Battalion, forming the Fourth Brigade of the Second Division, commanded by Brig.-Gen. James G. Harbord (made major-general end of June), were in reserve in a rest area at Montdidier, when the order to the front arrived. Jubilant at the thought of active service they crowded onto their trucks and traveled 30 wearying hours (72 miles) to the scene of battle. Reaching their destination stiff and sore in the early morning of 2 June, but without delay they moved into line as support division to the rear of the French (Les Mares Farm, Bois de Veuilly, Voie de Chatel, etc.). The Germans renewed their thrust that afternoon pushing the French before them till the *poilus* filtered through the unwavering line of marines, and the rear had become the *front.* It was the opening of the battle of Chateau Thierry, and found the "most vicious wedge of the German advance" facing the Americans. Hill 165 was the objective as the enemy advanced through a wheatfield, but the alert marines as expert riflemen "calmly set their sights and aimed with the same precision that they had shown upon the rifle ranges at Paris Island, Mare Island and Quantico." Their machine guns also took up the fire. The accuracy of the rifle fire took heavy toll of the German ranks. The artillery soon backed the staying powers of the riflemen and, with shrapnel, added to the killing power; the Germans ran to cover raked by the American fire. A French airplane was aiding the artillery aim. The aviator was so astonished at the marines' cool deliberate setting sights and adjusting ranges (the French ranks always emptied their magazines at random without raising their rifles to aim) and seeing each man select his human target, he signaled "bravo" to the sharpshooters. *The German drive for Paris was stayed with this day's resistance.* Then followed attacks and short advances and continued fierce counter-attacks and heavy bombardments that thinned the marine ranks sadly and forbade either rest or renewing the stock of rations. Cold rations and sleepless nights, shortage of food and absence of water often, for the terrific barrage killed most of the *runners.* But nothing could dull the courage and fortitude of those two regiments. However, 6 June found them still outside the woods, and with Bois de Belleau in the grip of the Germans it was impossible to recapture Chateau Thierry. The villages of Bouresches, on the right, and Torcy on the left, must also needs be taken to gain Belleau Wood, which was a rocky jungle protected by hundreds of machine guns and considered by the Huns as impregnable. At 5 P.M. the attack was started in waves, few — sometimes but one of the party — got through the hail of bullets and the bayonet, then the butt of the rifle, was all that was left to capture each machine gun nest. But Lieut. James F. Robertson with 20-odd men of his platoon captured Bouresches. The artillery with 50 batteries pounded the Bois de Belleau for an hour till it was an inferno. The woods had suffered but the machine nests were still alive and active as the assailants plunged further into the jungle, and the fighting was done from tree to tree in American style. The loss of life was costly. Individual acts of heroism (young Lieutenant Timmerman, Jr.'s platoon reached the wood, charged a nest, took two guns and 17 prisoners though outnumbered two to one) were very numerous. And thus the Bois (the marines call it "Hellwood") was a scene of continuous attacks and counter-attacks, and we read that "between 30 May and 18 June hardly a man removed his clothes or shoes." In less than a week the German 197th, 237th and 10th divi-

sions were so exhausted that the crack Fifth Guards Division had to be called in, then 28th had to be called. Thus one American division (the Second) wore out five German divisions. By the 10th the line was advanced 900 yards on a front of one and one-half miles and 300 prisoners, 30 machine guns, 4 trench mortars and stores of ammunition, etc., were captured. By the 28th the last of the German nests were captured together with guns and prisoners, after the artillery had torn the wood to pieces. Then the attack on Chateau Thierry became practicable. And the French have renamed the Bois de Belleau "Bois de la Brigade de Marine" (Wood of the Marine Brigade).

July brought relief and rest, also *replacement* of the depleted ranks. But already on the 18th we find the indomitable marines at the "grand offensive" in the neighborhood of Soissons, near Tigny and Vierzy, where they advanced facing a terrific fire from a machine-gun centre. Their losses enforced digging in and holding the ground taken. In the battle for the Saint Mihiel salient the Second Division occupied a line from Remenauville to Limey, night of 11 September, starting an attack of two days' objectives on the night of the 14th. They rushed over the rivulet Rupt de Mad, occupied Thiacourt, scaled its heights beyond and formed a line from Zammes-Joulney Ridges to the Binvaux Forest, finishing the two days' objectives by 2.50 P.M. of the first day. Casualties about 1,000 with 134 killed; participating in the capture of 80 German officers, 3,200 men, 90-odd cannon and vast stores. Next came (early October) to the marines the honor of capturing "the bald, jagged ridge" 20 miles due east of Rheims, known as Blanc Mont Ridge. It was a German "keystone" position. The commanding officer of the United States Marine Corps, Maj.-Gen. John A. Lejeune, considered the victory so valuable as (11 October) to commend the Second Division and to add: "As a direct result of your victory, the German armies east and west of Rheims are in full retreat, and by drawing on yourselves several German divisions from other parts of the front you greatly assisted the victorious advance of the Allied armies between Cambrai and Saint Quentin."

And the toll paid for these acts of unparalleled heroism gave the following sad figures: Of 8,000 men engaged in these fierce battles, this Marine Corps had as casualties by the end of June 126 officers and 5,073 enlisted men killed or wounded; over half the original quota. And but 57 United States marines were taken prisoner by the enemy, these wounded far in advance of their lines. As a mark of honor for the many individual acts of heroism of the corps 644 Distinguished Service Crosses were awarded to the members of the Second Division, over twice the number awarded any other division. Of this total the marines won as follows up to 17 March: Fifth Regiment Marines, 206; Sixth Regiment, 137.

MARINETTE, măr-ĭ-nĕt', Wis., city, county-seat of Marinette County, at the mouth of the Menominee River, on Green Bay, and on the Chicago and Northwestern, the Wisconsin and Milwaukee, and the Chicago, Milwaukee and Saint Paul railroads, about 50 miles north by east of Greenbay (city), and opposite Menominee, Mich. The harbor is large and safe, and the river affords opportunity for bringing logs from the forests along its upper course in both Wisconsin and Michigan. Marinette was settled about 1849–50 and in 1887 was incorporated. The water power is extensive and the lumber industry of Marinette is most important. The large lumber mills are the chief manufacturing establishments of the city. The four largest have a daily output of 1,000,000 feet of lumber. Other industrial establishments are pail factories, paper and pulp mills, box and broom factories, gas and traction engine and iron works, threshing machine factories, knitting mills, flour mills, furniture factories, cabinet shops and fruit canneries. The city carries on a lake commerce with all the important lake ports. The chief buildings are the city and county buildings, two hospitals, a public library, 20 churches, fine public and parish school buildings and Our Lady of Lourdes' Institute. In the vicinity is large assembly ground where various religious and educational conventions are held each summer. Pop. 14,610.

MARINI, Giambattista, jäm-bä-tēs'tä mä-rē'nē, Italian poet: b. Naples, 18 Oct. 1569; d. there, 25 March 1625. He was assisted by the Cardinal Pietro Aldobrandini at Rome, with whom he went to Turin, where he became secretary to the Duke of Savoy, Charles Emmanuel, but the envy of his enemies and his satirical humor involved him in various disputes. Marini's most famous work is the long epic 'Adone' (1623). His other works include 'La Lira' (1602–14); and a great collection of miscellaneous poems. Some of his sonnets are among the most perfect in the Italian language. He is the founder of the Marinist school of poetry, of which false, overstrained imagery, far-fetched metaphors and forced conceits are characteristic features. Consult Menghini, 'La vita e le opere di G. B. Marini' (1888).

MARINONI, Hippolyte, ē-pō-lēt mä-rē-nō-nē, French inventor: b. Paris 1825; d. 1904. He has invented many appliances for printing which have been of world-wide adoption; among them are a rotary printing-press which has been much used in France, another which printed in six colors 20,000 copies an hour, and at the Paris Exposition he exhibited a press which printed at a rapid rate two colors on each side of a sheet at one revolution.

MARIO, Giuseppe, joo-sĕp'pĕ mä'rē-ō, MARQUIS DI CANDI, Italian tenor: b. Cagliari, Sardinia, 18 Oct. 1810; d. Rome, 11 Dec. 1883. After serving in the Sardinian army he went to Paris, where after two years of musical study he was appointed first tenor of the opera, changing his name at the same time from De Candia to Mario. He made his début 2 Dec. 1838 as Robert in 'Robert the Devil,' and soon became the leading tenor of the world. His répertoire embraced all the great works of Rossini, Bellini, Donizetti and Verdi. He married the famous singer, Giulia Grisi, in 1854 and together they made an operatic tour of the United States. In his later years after his retirement from the stage in 1871 he lost his fortune through speculations, and the next year made a concert tour in this country.

MARIOLATRY. See MARY.

MARION, măr'ĭ-ŏn, **Francis,** American soldier: b. near Georgetown, S. C., in 1732; d. Pond Bluff, 27 Feb. 1795. He was the youngest in a family of six children. His grandfather, Benjamin Marion, was a Huguenot exiled from France in 1690. At 16 Francis showed his adventurous disposition by embarking on a small vessel bound for the West Indies. It was wrecked and he barely escaped death by starvation. He returned home and worked several years on a farm. In 1760–61 he served in campaigns against the Cherokees. Thenceforth until 1775 he lived on his plantation at Pond Bluff in the parish of Saint John.

In 1775 Marion was elected member from Saint John in the South Carolina provincial congress, which adopted the bill of rights and voted money for raising troops. He was chosen captain (21 June 1775) and took the field against the British and the Tories. He took part in the capture of Fort Johnson (14 Sept. 1775), and because of his ability in organizing and discipline was promoted to major. He participated in the patriot victory (28 June 1776) at Charleston, which gave the Southern States respite from active fighting for nearly three years. Appointed lieutenant-colonel, he led his regiment in the unsuccessful attack on Savannah (September 1779). In 1780 Marion, now a brigadier-general, was obliged to take refuge in forest and swamp. Beginning with a handful of men, less than 20, he gathered recruits, fearless riders and good marksmen, who formed the famed "Marion's brigade." At times they numbered several hundred. They came and went at their leader's bidding, providing their own equipment and rations. Part of the time they were at work on their farms, planting crops. These rough and ready troopers became the terror of the British regulars and the Tories, although in justice to Marion's men it should be said that they committed no acts of wanton cruelty and burned no buildings on Tory homesteads. The stories of his adventures read more like fiction than history. His scouts kept close watch of the enemy's movements, and detachments of the brigade struck blow after blow, surprising and capturing small parties of soldiers. At times they united with larger bodies of troops for important engagements. After a vain pursuit, Tarleton named Marion the "Swamp Fox." Failing in his attempt against Georgetown (December 1780), he retired to Swan Island and prepared for a second attack (13 Jan. 1781), which was also unsuccessful. Then he joined with Col. Henry Lee in reducing Fort Watson (April 1781). After raiding 200 miles of country he commanded the first line in the battle of Eutaw Springs and took many prisoners. For his gallantry in this engagement he received the thanks of Congress. From 1782 to 1790 Marion served in the State senate and was a member of the State Constitutional Convention in 1790. He opposed harsh treatment of the Tories and condemned the Confiscation Act of 1782. In 1784 he married a wealthy lady, Mary Videau, who survived him with no children. He was a man of attractive personality. Of slight figure, he was capable of great endurance and accustomed to abstinence. As a leader he was admired and beloved. He justly ranks among the heroes of the Revolution. Consult Biography by Horry and Weems (1815); Simms, 'Life of Francis Marion' (1844); Tarleton, 'History of the Campaigns of 1780–1781' (1787).

MARION, Ala., town, county-seat of Perry County, on the Southern Railroad, about 60 miles west by north from Montgomery. It is situated in a fertile agricultural region, and its industries are connected with cotton pressing, etc. It is the seat of the Marion Female Seminary, established in 1836; the Judson Female Institute (Baptist), established in 1839; Lincoln Normal School for colored pupils (Congregationalist), and the Marion Military Institute. Pop. 1,834.

MARION, Ill., city, county-seat of Williamson County, on the Illinois Central, Chicago and Eastern Illinois and Missouri Pacific railroads, about 150 miles south by east of Springfield. It is situated in an agricultural region in which are large deposits of coal. The chief industries which contribute to the support of the city are coal-mining, fruit-raising, manufacturing, pianos, gloves, flour and raising cattle and mules. Marion is the chief trade centre of a large portion of Williamson and adjoining counties. Pop. 7,093.

MARION, Ind., city and county-seat of Grant County, situated 73 miles northeast of Indianapolis on the Mississinewa River, in the heart of the Indiana agricultural country. It is served by four railway systems, the Pennsylvania, Big Four, Clover Leaf and Chesapeake and Ohio, also has three traction lines running north, east, south and west. Marion classes as a manufacturing city, the chief products being flour, paper and pulp, foundry products, bottles, furniture, rolling-mill products, auto trucks, motors, shoes, electric specialties, insulated wire, druggist wares, gloves, both heating stoves and ranges. The exports are extensive, about 350,000 tons per year. Marion has 30 churches, Y. M. C. A. and Y. W. C. A. Some of the public buildings are the public library, Masonic temple, courthouse, Normal College, new high school, costing $180,000. A National Soldiers' Home is situated at Marion, which cost about $1,500,000. The water plant is owned and operated by the city. Pop. 23,000.

MARION, Iowa, city, county-seat of Linn County, on the Chicago, Milwaukee and Saint Paul Railroad, about 110 miles northeast of Des Moines. It was settled in 1839 and in 1852 was incorporated. It is situated in a rich agricultural region in which the chief products are corn, oats, hay, wheat and vegetables. Considerable attention is given to stock-raising. Marion is the headquarters of a railroad division and has large railroad repair shops, freight yards and a round-house. Other industrial establishments are greenhouses, flour mills, cigar factory, cement block and tile factories, wholesale bakery and wholesale produce house. Saint Berchman's Seminary, Catholic boarding school for boys, is located here. Pop. 4,660.

MARION, Kan., city, county-seat of Marion County, on the Cottonwood River, and on the Chicago, Rock Island and Pacific and the Atchison, Topeka and Santa Fé railroads, about 85 miles southwest of Topeka. It is situated in a fertile agricultural region in which considerable attention is given to stock-raising. The chief manufactures are flour and dairy products. Pop. 1,951.

MARION, Ohio, city and county-seat of Marion County, on the Erie, Cleveland, Cincimati, Chicago and Saint Louis, the Hocking Valley and the Pennsylvania railroads, 49 miles north of Columbus and 77 miles from Toledo. Marion was settled in 1815 by people from Rhode Island, and was incorporated in 1820. It is in the centre of a rich agricultural and limestone country. There are five big quarries on the outskirts of the city. There are 39 factories in the city, employing 4,200 people. The products of the main industries are steam shovels, threshing machinery, silk and re-rolled steel. Marion is a division point of the Erie railroad, and the transfer point for all eastern and western shipments; many employees of this road reside in Marion. There are five banks and four building and loan companies. The government is vested in a mayor and a council, chosen biennially. The percentage of foreign population is very small. Pop. 25,100.

MARION, S. C., city, county-seat of Marion County; on the Raleigh and Charleston, and the Atlantic Coast Line railroads, about 100 miles west of Columbia. It is surrounded by rich farm lands, the chief products of which are tobacco and cotton. It has large cotton mills, cottonseed-oil mills, lumber and flour mills and foundries. It ships to the large markets considerable tobacco and cotton products. Pop. about 5,020.

MARION, Va., town, county-seat of Smyth County, on the Marion and Rye Valley, and the Norfolk and Western railroads, about 140 miles southwest of Lynchburg. Marion was settled in 1832 and in 1871 was incorporated. The chief industrial establishments are flour and lumber mills, wagon and table factories, foundry and machine works and pulverized limestone plant. Mining and quarrying in the vicinity contribute to the industrial wealth of the town. It is the seat of the Marion Female College (Lutheran) and the Southwestern State Hospital for the Insane. The water for drinking and domestic purposes is brought from springs in the hills about three miles distant, and the waterworks plant is owned and operated by the town. Pop. 2,727.

MARIOTTE, Edme, ĕd-mĕ mä-rē-ŏt, French physicist: d. 12 May 1684. He lived for the most part at Dijon, and was made prior of Saint-Martin-sous-Beaune. He became a member of the Academy of Sciences upon its formation, and was one of the founders of experimental physics. "It is Mariotte," said Condorcet, "who first in France introduced into physics a spirit of observation and of doubt." He discovered independently the law known by his name — also discovered by Robert Boyle (q.v.) and known as Boyle's law, — that if the temperature remain constant, the volume of a gas will vary inversely as the pressure.

MARIOTTE'S LAW, *in physics,* the principle that the volume of a gas, under constant, that is, unchanging, temperature and pressure, varies inversely as the pressure. It is identical with Boyle's law, the latter name being applied to it in the United States and England, and the former in continental Europe. See LIQUEFIED AND COMPRESSED GASES.

MARIPOSA GROVE, a State park of 2,560 acres, situated in Mariposa County, Cal. It contains about 465 trees of the *Sequoia gigantea,* some of which are thousands of years old. The largest specimen is the Grizzly Giant, with a main limb over six feet in diameter at 200 feet above the earth and a circumference of 94 feet. The tallest tree is 272 feet high, and several are over 250 feet. A roadway 9½ feet wide has been cut through the heart of one of the giants.

MARIPOSA LILY, or **BUTTERFLY LILY,** popular names for various species of *Calochortus* of the family *Liliaceæ.* The numerous species, all of which are natives of western United States and British Columbia, are characterized by coated corms; rather leafy, generally branched stems; and showy, six-segmented flowers. Almost all the species are in cultivation for ornament, some, natives of the Colorado Desert, being suited to arid conditions, others to fairly moist soils, still others to very cold localities, as species indigenous to the Sierra Nevada. All will stand extreme cold, but not alternate freezing and thawing, hence their failure under such conditions. The bulbs should be planted in late autumn in any kind of soil. After the tops have become yellow subsequent to flowering in the following year the bulbs should be taken up, divided, and kept dry until planting time. They are often grown in pots under glass.

MARIPOSAN, or **YOKUT,** a linguistic stock of North American Indians, which once included about 40 tribes in southern California, in the region of Tulare Lake. See YOKUTS.

MARIQUINA, P. I., town in the province of Rizal, Luzon, eight miles northeast of Manila. It is situated at the intersection of several main highways, has shoe and leather factories and medicinal iron springs. Pop. 8,180.

MARIS, mä'rĭs, **Jakob,** Dutch painter: b. at The Hague, 25 Aug. 1837; d. 8 Oct. 1899. He began his art studies at the local academy, choosing landscape as a specialty, and receiving instruction from Ströbel and Van Hove, which latter he followed on his removal to Antwerp. He studied also under Keyser, director of the Antwerp Academy. Going to Paris he came under the influence of the Barbizon school, and reached his full power as a painter of figures and landscape in combination. In 1871 he returned to his native town. His brush work and use of chiaroscuro are essentially French. Among his numerous works are 'View of Schiedam'; 'View of a Town in Holland'; 'On the Sea Shore'; 'Mother and Children.' Examples of his work may be seen at the Metropolitan Museum, New York.

MARIS, Mathew, Dutch painter, brother of Jakob Maris (q.v.): b. The Hague, 1839; d. London, 22 Aug. 1917. In his youth he traveled and worked with his elder brother; in 1855 they lived in Antwerp sharing quarters with a young student named Alma-Tadema (q.v.); in 1860 the brothers studied and sketched in Germany and Switzerland; in 1870, in Paris, Mathew was enrolled in the National Guard and performed military service during the siege. Shortly after he settled in London, where he remained till his death. He was a striking example of the so-called "artistic temperament"; he painted what he liked and when he liked, with the result that his works

are extremely scarce. His work is characterized by fine qualities of color and "imaginative wizardry." At sales his pictures brought very high prices; two of them fetched $33,075 in London in 1906; one produced $17,850.

WILLIAM MARIS, a younger brother, was also a painter of note (b. 1843; d. The Hague, 10 Oct. 1910). He received his training from his brothers and was the most truly Dutch in his artistic sympathies. A sunny optimism pervades his work, expressed in wide skies, brilliant sunshine and gay coloring. He spent most of his life at Ryswijk, near The Hague. At the Alexander Young art sale in London in 1910, five of his studies were sold for $12,400; while nine pictures by his eldest brother fetched $51,425, mostly purchased by Dutch collectors.

MARISCAL, Ignacio M., Mexican statesman: b. Oaxaca, 5 July 1829; d. Mexico City, 16 April 1910. He received his diploma as a lawyer in 1849, and practised his profession until 1857, when he was elected a member of the Federal Congress. Two years later he was made justice of the Supreme Court of Oaxaca, and in 1860 circuit judge of the states of Oaxaca, Vera Cruz and Puebla. In 1861 he was again elected to the Federal Congress, being assigned the additional duties and responsibilities of government assessor of church properties; served as justice of the Supreme Court in 1862; as sub-secretary of foreign affairs in 1863, and was appointed first secretary of the Mexican legation at Washington in August of that year; chargé d'affaires 25 Oct. 1867, Secretary of Justice and Public Instruction in 1868; Envoy Extraordinary and Minister Plenipotentiary at Washington 1 June 1869; Secretary of Foreign Affairs 10 March 1871; Envoy Extraordinary and Minister Plenipotentiary at Washington June 1872; justice of the Supreme Court of the Federal District and director of the National School of Jurisprudence July 1879; Secretary of Foreign Affairs 22 Nov. 1880; special envoy to Great Britain May 1883 and Envoy Extraordinary and Minister Plenipotentiary October 1884; Secretary of Foreign Affairs June 1885. He was a member of the Geographical and Statistical Society of Mexico. He was closely associated with President Juarez throughout the War of the Reform, was secretary and legal counsel to the Mexico legation at Washington during the War of Intervention, and was the author of several historical and other works.

MARISTS, mā'rĭsts, either of two modern religious congregations in the Roman Catholic Church. The Marist Fathers, or Society of Fathers of Mary, originated in Lyons (1816), where a number of religious devoted themselves to missionary work, which extended over the Pacific islands and in 1845 passed on to Australia. The Marist Brothers, whose object was the education of youth, were founded a year later at Marseilles, and chose for its field of labor the south of France. The Marist Fathers have 156 members in the United States which they entered 1849. Their headquarters is at Brookland, D. C. They have schools at Manchester, N. H.; Lowell and Lawrence, Mass., and New York.

MARITIME LAW. Broadly speaking, the subject matter of any action over which an Admiralty Court could take jurisdiction should be considered a topic of the Maritime Law. In this definition prize cases would be included; but the right of capture and other belligerent rights on the high seas in time of war, the immunities of neutral shipping and cargoes, contraband traffic, etc., more properly considered, are topics of International Law (q.v.). However, oversea commerce being international there is little in the *lex maritima* which has not an international aspect. The maritime law of Great Britain and the United States is rooted in the usages and customs of merchant seafarers, shipmasters and seamen, which are of remote antiquity and have been preserved in the Code and Digest of Justinian and other compilations hereafter mentioned. The oldest repository in England of this law was the 'Black Book of the Admiralty,' written in Norman French and dating partly from the reigns of Edward III and Richard II and partly from the reigns of Henry IV, Henry V and Henry VI, "long before any controversies arose between the Admiralty and King's courts about foreign contracts, whereof they had been in peaceable possession time out of minde" (Prynne's 'Animadversion on the Fourth Part of Coke's Institutes,' 1668). An early record of the administration of maritime law in England is found in the Domesday of Ipswich, 17 Edward I (A.D. 1289). The 'Black Book' has disappeared but an English manuscript, which was in the library of the College of Advocates at Doctors' Commons until the dispersal of the college in 1858, had in recent years done service for the lost original. The substantive sea law of the 'Black Book' is contained mainly in a transcript of the Laws of Oleron. This last-named compilation, which takes its name from an island off the west coast of France, near Rochefort, is extant in several manuscripts. The oldest of these, written in a mixture of old French and Gascon, and now in the Guildhall at London, where it was brought from the archives of Bordeaux, probably dates from the end of the 13th century. The compilation is much older, no doubt; for the Laws of Wisby, by which the merchants of the Hansa towns and other German, Scandinavian and Russian trading communities on the Baltic and North Sea regulated their conduct are mere condensations of the Laws of Oleron — and the Hanseatic League was formed in 1252.

A more complete code of sea laws than either of those mentioned is the 'Consolato del Mare,' of uncertain age and pedigree. Grotius asserts that it was compiled at the order of the "ancient Kings of Arragon," whereas Azuni and others claim it to have been the work of Pisan lawyers. Both may be right. The Consolato del Mare was evidently not compiled at one sitting; its matter is drawn from many sources, including the Roman *corpus juris* and the laws and customs of Italian, French and Spanish marts of commerce. While not completed until the 14th century, the extant form is apparently the resultant of accretions to a nucleus dating back possibly to the 11th century. Anyhow, a *lex maritima* had become generally recognized in Europe toward the end of the 12th century and its distinction from the common law of England, as asserted by Prynne, who is quoted above, is testified to by an early rescript of the 'Black Book' providing,

that "all those who doe sue any merchant, mariner or other person whatsoever at common law of the land for any thing of auntient right belonging to the maritime law . . . shall be fined to the king for his unlawful and vexatious suite." The extent to which the ancient compilations have maintained their authority may be estimated from the fact that a fragment of the law of Rhodes, embodied in the Digest of Justinian and transcribed into the Consolato, states as correctly as any recent textbook the modern law of jettison and general average, while the rubric *de nautico foenore* (Dig. 22, 2; Code 4, 33) gives the present rules on bottomry and respondentia with absolute exactness.

The principal topics of Maritime Law (see articles under separate titles) are: Affreightment, under which head may be included the law governing contracts of shipmasters to carry freight and their resulting responsibilities as common carriers; Barratry, a sea crime which is committed when a master or crew do any unlawful acts tending to their advantage and to the detriment of the owner of a vessel — mutiny is an extreme form of barratry; Bill of Lading (q.v.; also COMMERCIAL LAW and NEGOTIABLE INSTRUMENTS); Bottomry, a form of contract whereby, figuratively, the keel or bottom of a ship, but in reality the entire vessel, is hypothecated to secure the repayment of money loaned, or to pay for repairs done or materials or supplies furnished and necessary to enable the vessel to complete a voyage; Charter-party, a contract of affreightment whereby the owner agrees, not to carry a particular consignment, but to let the whole or part of his ship to a merchant or other person for a particular voyage; Collision, under which title the rules for the assessment and apportionment of damage resulting from careless navigation are collected; Demurrage, the money required to be paid by the charterer for a vessel in compensation to the owner for her detention beyond the time agreed to for the loading or unloading of a cargo; General Average may be defined as contributions to be made by all parties interested in a ship or her cargo to even up the losses arising in consequence of an extraordinary sacrifice — for example, the jettison of part of her cargo — as the means of preserving from destruction the vessel or the rest of the goods she carries; Marine Insurance (q.v.) is a comparatively recent development of maritime law; the first policies it is said were issued by the Florentine merchant princes of the house of Medici; Pilotage, the practice of the pilot's professiion is governed by local usages peculiar to each port and by legislative acts, which, in the United States, may take the form of either Federal or State laws; Registry of vessels and the transfer of ownership or flag, practically all matters under this head being regulated by statute in each country; Salvage, a compensation due to a person through whose gratuitous exertions a vessel or its cargo had been rescued from the perils of the sea; Wharfingers, properly "wharfagers," the owners, occupiers or custodians of a wharf.

All contracts of a maritime character are cognizable by the maritime law and enforcible by the courts administering the same. In the enforcement of contractual obligations arising out of the relations between insurer and insured or shipper and carrier or owner and charter-party, the common-law courts as well as the courts of admiralty might take jurisdiction. But in a case of bottomry, collision, general average or salvage, where the common law of the land and the law of the sea widely diverge, the jurisdiction of the maritime tribunals is paramount. Obligations *ex delicto* are justiciable in courts of admiralty when the wrong was committed within their territorial jurisdiction. This jurisdiction extends to the high seas, the national territorial waters where the tide ebbs and flows and other navigable water connects with and leading to tidewater. In the United States admiralty jurisdiction may extend even to navigable waters disconnected from the sea and situated entirely within a single State. The Federal District Courts exclusively have original jurisdiction in admiralty cases. Under the maritime law no more than under the common law could there be a recovery of damages for death negligently caused. Such recovery is now permitted by statutory enactment; but the limitation of owner's liability to the value of the salvage from the wreck in which the death occurred and to the freight money earned makes the statutory relief granted practically valueless. The English law on the subject is more liberal, though, where a calamitous loss occurs and the claimants are many, the total amount of damages recoverable is too small to be compensatory in any proper sense. In fact, it is possible that the limitation by law and distribution by insurance of the risks incident to maritime commerce may have too thoroughly eliminated the motive of self-interest as a factor in the promotion of efficiency and safety. When a ship is lost its owner may make a profit, receiving more than its value from the insurer; similarly, the merchant may, and often does, get more from the underwriter than the value of a cargo lost; the underwriter averages his losses and, on the whole, makes a profit out of his business. The laws for the inspection of vessels, the licensing of masters and other officers, the rules of navigation and concerning lights and other signals and the statutes prescribing imprisonment and other heavy penalties for neglect to observe these laws and regulations or supply the minimum life-saving equipment do not seem to provide an incentive equal to that which would be provided by the risk of an uninsurable total loss or unlimited liability for carelessness in the operation of vessels. The statutes, moreover, have been proven deficient in many respects — for instance, it appeared from the inquiry into a recent celebrated case that the inspection of hulls did not include a test of stability.

The rights and duties of masters and seamen toward each other, the vessel owner, the shipper or receiver of cargo and passengers are in part regulated by usage. By far the larger part of this department of the maritime law however is statutory. The administration of ports, the issue of clearance and other papers and similar police regulations affecting shipping are, generally, in the form of prescriptions made by the highest legislative authority, though they may be the subjects of mere municipal ordinances. These regulations have become internationalized by commercial treaties on a basis

of reciprocity, foreign shipping at practically all the ports of the world sharing burdens and advantages equally with domestic vessels. Domestic regulations with respect to life-saving equipment also have international scope, because no foreign vessel can leave a port without clearance and ship's papers will not be granted until the local safety rules have been complied with. The International Marine Conference held at Washington in 1894 evolved a set of "Regulations for Preventing Collisions" and the first internationally uniform "Rule of the Road." Articles 15 and 16 of the convention agreed to this conference, prescribing a system of sound signals and "moderate" speed in fog or thick weather, were considered the most important and innovatory of the regulations then adopted; but shipmasters have continued to act on the principle, "when in a place of danger, get out as quickly as possible." The Seaman's Act of 1914 and the Safety at Sea Conference held in Berlin in the spring of the same year are indicative of progress, though under existing world conditions their effect has not been appreciable.

Proceedings in Admiralty Courts are quite informal. Usually they are *in rem*, that is to say, the ship or cargo or some part of either are proceeded against rather than the master or owner in person. The initiation of an action takes the form of posting a libel, i.e., attaching the same to the mast or some conspicuous place on the vessel, or to that part of the cargo against which a claim is made. The attachment of a libel creates a lien which can be discharged only by the entry of a bond, or the deposit in court of adequate security, or the payment of the claim. See DANISH SOUND DUES.

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MARITZA, mä-rēt'sä, Turkey, a river of Adrianople, the ancient Hebrus, rising as the Topolnitza, near the Bulgarian frontier, in the Balkan Mountains, and flowing through eastern Rumelia, southeast to Adrianople, where it bends to the southwest and falls into the Ægean Sea by the Gulf of Enos. It is over 300 miles long and navigable to Adrianople, about 100 miles from its mouth.

MARIUS, mā'rĭ-ŭs, Gaius, Roman general: b. about 156 B.C., in Cereatæ, in the Volscian territory; d. Rome, 13 Jan. 86 B.C. He won his first military repute at Numantia in 134, beginning his rapid rise from the ranks; was made tribune of the people in 119; increased his political power by marrying Julius Cæsar's aunt; became prætor in 115; went to Spain in the next year, suppressing brigandage there; and in 109 accompanied Metallus to Africa. Two years later he was chosen consul, displaced his superior officer and made a brilliant campaign. His success was so great that he was elected consul four times in succession (104–101 B.C.)—a proceeding counter to law and entirely unparalleled — so as to meet the invasion of Italy by the Cimbri and Teutons. He defeated the latter tribe at Aquæ Sextiæ in 102, and the Cimbri at the Raudian Fields in 101. In 100 he was again elected consul. He made the fatal mistake of plunging into party politics, allied himself with the most disreputable leaders of the popular party, and, in his envy of the rising fame of the patrician Sulla (q.v.), attempted to remove him from his command in the Jugarthine War. Civil war broke out in 88. Sulla was victorious. Marius fled to Africa, whence he returned to Italy on the successful rising in Rome under Cinna. The first great proscription followed and many of Marius' opponents were killed. Marius was elected consul for the seventh time for 86 B.C., but died soon after he entered upon the office. Consult Beesly, 'Marius and Sulla' (1878).

MARIUS THE EPICUREAN, the chief work in fiction of Walter Pater. It is the story of a young Roman of the days of Marcus Aurelius, but in the problems and experiences of young Marius in ancient Rome, Pater has given also something of the problems and experiences of a young man at the end of the 19th century. In the days of Marcus Aurelius the ancient world was changing into the mediæval Another such period was the Renaissance, in which the mediæval world was changing to the modern. In our days it may be civilization may be changing to something very different from the last few hundred years. Of the first of these great changes Pater wrote in 'Marius the Epicurean.' Of the second he began to give a picture in 'Gaston de Latour,' a later novel of which he wrote only the first part. To the last period, his own, Pater devoted critical rather than creative thought. 'Marius the Epicurean,' therefore, is deeply informed with ideas; in fact the very titlepage names "Sensations and Ideas." Pater became known first as a critic; in this novel he turned to express in the form of life the ideas which he had previously presented as matter of thought. A good many of Pater's ideas will be found in 'Marius': the fundamental conception of Epicureanism is a restatement of the theory of life which had already been presented in the conclusion of the Renaissance and had since been much and sometimes severely criticised. Flavian's plans for a career in literature have much in common with the ideas of the later essay on style. The work is characteristic of its author not only by its ideas, but by its general form. After this novel Pater published several shorter pieces which he called 'Imaginary Portraits.' In each of these he presented a figure which embodies some idea or positron in the philosophy of art and life, sometimes an actual character like Watteau, sometimes an ideal figure like Sebastian von Storck. He subsequently wrote several other things of the same sort which is now generally thought of as very characteristic of his art and thought. 'Marius the Epicurean' is an earlier, longer and more fully developed imaginary portrait. Its interest is not in the

story, but in the idea, or in this case in the progress of the idea. Marius grows up in the old pagan world, comes to know all the cultivation and refinement of the ancient civilization, weighs the older philosophies of life and art and finally devotes himself to the new and growing religion of Christ. Like all of Pater's fiction the story is most sedulously careful of its surroundings and environment, and the pictures of life on the great old Roman family estate, the popular festival, the interview with the emperor, the lecture on rhetoric by Fronto are among his best known. In fiction in general there is an especial place for those books which present adventures and experiences of the soul rather than of the man as seen in the every-day world. There were a number of such at the end of the 19th century. Among the most famous of these studies of the religious life are 'John Inglesant' and 'Robert Elsmere.' 'Marius the Epicurean' is quite as interesting as either of these to those who follow the workings of the spirit, and quite as characteristic of the time which it presents and of the time in which it was written.

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MARIUT, mä-rē-oot', **Lake,** Egypt. See MAREOTTS.

MARIVAUX, Pierre Carlet de Chamblain de, pē-ār kär-lā dė shäm-blăn dė mā-rē-vō, French dramatist and novelist; b. Paris, 4 Feb. 1688; d. there, 12 Feb. 1763. He lost his patrimony in the Mississippi scheme, and also a young wife to whom he was deeply attached, and took up literature as a living. He was so successful that he became an Academician in 1742 or 1743. He wrote essays in periodical form, the 'Spectateur Français' having a hint of English influence in both matter and name. His novels, especially the unfinished 'Vie de Marianne' and 'Paysan parvenu,' were a protest against the literary morals of contemporary fiction. But he is best known for such plays as 'Les Jeux de l'Amour et du Hasard' (1730), 'Les Fausses Confidences' (1738), 'Le Legs' (1736) and 'La Mère confidente' (1735), which are marked by a total opposition to the style and manner of Molière, by much skill in intrigue and in portraying women and by the peculiarly artificial and elaborate style, which takes its name "Marivaudage" from the author. Consult Savollée, 'Marivaux inconnu' (1880); Fleury, 'Marivaux et la Marivaudage' (1881); Gossot, 'Marivaux Moraliste' (1881); Larroument, 'Marivaux, sa Vie et ses Œuvres' (1894); Deschamps, 'Marivaux' (1897).

MARJORAM, a genus of annual or perennial herbs and a few shrubs (*Origanum*) of the family *Menthaceæ*. The species of which there are about 25 are mostly natives of the Mediterranean region and southwestern Asia. They have several-flowered whorls of labiate flowers arranged in spikes. Two species are widely cultivated in gardens for culinary purposes, being used fresh, dried or in decoction for flavoring soups, stews, dressings, sauces and salads. Common or pot marjoram (*O. vulgare*) is a hardy perennial with pink or purple flowers and highly aromatic leaves. It succeeds best upon warm garden soils well exposed to the sun, and may be propagated by seeds, divisions or cuttings. Sweet marjoram (*O. marjorana*) is also a perennial, but is tender and consequently treated as an annual, hence the popular name annual marjoram. It is usually raised from seeds sown in a hotbed or greenhouse and transplanted to ground like the above.

MARK. The original Jewish name of Mark was John (Acts xii, 12, 25; xv, 37), and it is not known when he was given or assumed the second, Latin, name by which he has always been known. Of his early life nothing is positively known. It cannot be said to be more than an attractive possibility that it was at the house of his mother, Mary, that Jesus met his disciples for their last supper, and that in consequence this upper room became the permanent meeting place of the Jerusalem disciples, and also that Mark was the youth who followed the crowd to the arrest of Jesus in Gethsemane. Peter later called him his "son" (1 Peter, v, 13), from which title it is commonly inferred that he began his Christian life under the influence of that apostle. The first distinct appearance of Mark in history is as an attendant of Paul and Barnabas, the latter being his cousin (Col. iv, 10, not "nephew," as the Greek word has been erroneously translated). The party went from Antioch to Cyprus and thence to Perga, on the mainland of Asia, where Mark deserted, returning to Jerusalem. Because he did this Paul refused to take him on his second missionary tour and a break with Barnabas resulted, after which Mark accompanied the latter to Cyprus again. A reconciliation with Paul must have later come about, since Mark is favorably spoken of in Paul's letters to the Colossians and to Philemon, as again still later in the second letter to Timothy. More uncertainty attaches to the mention of Mark in First Peter. Perhaps the most satisfactory conclusion is to take "Babylon" as designating Rome and for this and other reasons (see article PETER, EPISTLES OF) to give to this mention a still later date. On this view, after the death of Paul, Mark would have remained in Rome and have attached himself to Peter. This would be in harmony with the language of Papias who asserted a relation between the two. Any further details rest on more or less uncertain tradition. The reported connection of Mark with Alexandria is in no way improbable, but whether he was a martyr there or died a natural death is unknown. The tradition that he was connected with the church at Aquileia, which is the basis of the honor paid in Venice to his memory, is no more to be depended on. It may have been the result of personal reminiscence that the epithet *κολοβοδάκτυλος* was attached to him. This word means stunted or mutilated in the fingers ("stub-fingered" ?), but its application in Mark's case is nowhere defined, and many explanations have been proposed, such as, that his fingers were unnaturally short; or, as the Greek word would equally apply to toes, that they were shortened, perhaps causing lameness, or that he had mutilated himself to evade priestly service; or, finally, that the word is used figuratively to suggest the comparative brevity of his gospel and its failure to contain much that is found in Matthew and Luke. For the connection of Mark with the second Gospel and bibliography, see article MARK, GOSPEL ACCORDING TO.

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MARK, Edward Laurens, American anatomist: b. Hamlet, Chautauqua County, N. Y., 30 May 1847. In 1871 he was graduated at the University of Michigan, and in 1876 took the degree of D.Ph. at the University of Leipzig. Dr. Mark was instructor in mathematics at the University of Michigan in 1871–72 and in the following year was astronomer of the United States Northwest Boundary Survey. From 1877 to 1883 he was instructor in zoology, from 1883 to 1886 assistant professor and since 1885 Hersey professor of anatomy at Harvard University. Since 1900 Dr. Mark has also served as director of the Harvard Zoological Laboratory. Since 1903 he was director of the Bermuda Biological Station for Research. He was United States delegate to the Fourth International Zoological Congress at Cambridge, England, in 1898. He has translated from the German, O. Hertwig's 'Text-Book of the Embryology of Man and Mammals' (1892); Korschelt und Heider's 'Text-Book of the Embryology of Invertebrates,' and published contributions to the *Bulletin of Comparative Zoology.* He edited contributions from the Zoological Laboratory, Harvard Museum of Comparative Zoology, since 1884. Consult Parker (ed.), 'Mark Anniversary Volume' (New York 1904).

MARK, Gospel According to. Character and Purpose.— Of the four little books called "Gospels" the second is the briefest and simplest. In the most direct fashion possible salient events of the Galilean ministry of Jesus are set forth in the first two-thirds of the book, while the last third is mainly occupied with the events of the last week of Christ's life and of his death and resurrection, the second part being given with much more of detail than the first. The book might be analyzed as follows: Introductory, the ministry of John the Baptizer, the baptism and temptation of Jesus (i, 1–13). I. The early Galilean ministry of Jesus, marked both by wide attention and by increasing hostility which culminated in the charge that Jesus was in league with Satan, this part of Christ's work ending with the choice of the 12 apostles (i, 14–iii, 35). II. Later ministry in Galilee and its neighborhood, introducing parabolic teaching and consisting largely of the training of the 12 (iv, 1–x, 52). III. The entry into Jerusalem and the Jerusalem teaching, mainly controversial, in the Temple (xi, 1–xii, 44). IV. The Eschatological Discourse (xiii, 1–37). V. The closing scenes, anointing at Bethany, last supper, agony in Gethsemane, death and resurrection (xiii, 1–xvi, 20 (8?). No purpose appears except to bring the events recorded as clearly before the readers' minds as possible, so that they might know thus much, at least, of what Jesus did and said. The book manifestly is not a missionary tract with the intent to persuade the unconvinced, but rather one who is himself a disciple tells these things to his fellow-disciples for their instruction. It has often been overlooked that the author presents as himself accepting the stupendous claims of Jesus to be the supreme master of men and their destiny and his corresponding demands for their supreme allegiance. But while these are carefully and sympathetically recorded, the main impression gathered from this record of the ministry of Jesus is that of a mighty, unresting, triumphant worker, who yet evokes the intensest hostility of the religious leaders of his nation. But the primary purpose to be recognized throughout is narration.

Authorship and Sources.— No name has ever been connected with this book except that of Mark. Presumably because of its brevity which might seem perhaps to involve incompleteness, this Gospel was for a long time less quoted than Matthew or Luke. But as it was included in the 'Diatessaron' of Tatian it must have been in general acceptance for some time before the year 150; in fact, there is no reason to doubt that from the time of its composition wherever known it was accepted as authoritative. The earliest tradition which has come down to us, connecting itself with the name of Papias who was acquainted with a number of apostles and others who had seen Jesus, makes Mark the author of a narrative which embodied the reminiscences of Peter. The second Gospel answers well to this description. There are many touches which imply the remembrance of an eyewitness, such as that the grass was green (vi, 29); the look of Jesus (iii, 5); or his turning to look (v, 32). The tradition that this eyewitness was Peter is confirmed by the character of many details of events in which Peter had a share or in which he would be specially interested. It is not, however, to be thought that Peter was Mark's sole authority or even that the principal share of the book is due to him. It may well be held that the main source from which Mark drew his material was the common stock of apostolic reminiscence and preaching, what must at first have been an "oral gospel," which presumably took a somewhat stereotyped form both in content and in language for catechetical purposes (Luke i, 4), and which may have been committed to writing before Mark used it. It has been held by some that Mark also shows knowledge of the "Logia" document (also called "Q," see article GOSPELS), but in our ignorance of the scope of this document Mark's knowledge of it cannot safely be asserted.

Date and Place of Composition.— No date can be positively set for the composition of the Gospel according to Mark. It has been commonly dated immediately before the destruction of Jerusalem and thought to have been written at Rome. The latest conclusion of critics, notably of Harnack, based on his view of the early date of Luke's writings, sets the date decidedly before the year 60 and makes Jerusalem the place of original composition. There, or at Rome later, it might have been seen by Luke in its earliest form, while it is possible that additions were made to it before it was given to the world in its present form, which probably happened at Rome. (The "Latinisms" in its language are, however, no proof of relations to Rome, as they are merely such as had been everywhere in the empire adopted into the "Koine," the common Greek of the time). It has been suggested that Mark's repeated revision of his original work resulted in what may be called three editions, the first, Palestinian and used by Luke, the second, made at Alexandria (with which city tradition associates Mark in his work), and used by the author of the first Gospel, the third, our present Gospel according to Mark, having been completed and given to the world at Rome. (See

article GOSPELS). Much of this theory, however, is undemonstrable. But it seems safe to assert that the substance of the book belongs decidedly before the year 60 and was very possibly composed in Palestine, while in its final form it is connected with Rome.

Integrity.— It is the verdict of textual criticism that the last verses of the Gospel (xvi, 9–20) were not a part of the original work. They are lacking in only two manuscripts, the Vatican and the Sinaitic, but these are the most valued of all. A manuscript of the Old Latin replaces these verses with another, shorter ending for the genuineness of which no one contends, and four Greek uncials, one cursive, and also manuscripts of early translations into Syriac and other languages give both endings. An Armenian manuscript gives the name Aristion as the author of the verses in question. There is, further, a notable lack of quotation of these verses by the Fathers, while several Fathers assert that in their time they were not to be found in the best copies of the Gospel. On the basis of the merely textual evidence, however, the genuineness of these verses might be accepted, but there is general agreement among scholars that the internal evidence is decisive against their genuineness. The vocabulary, the style, the thought of these verses are sufficiently unlike the rest of the Gospel so that the great majority of competent critics hold that they are not by Mark. Various explanations have been proposed for the abrupt close of the original text at the end of the eighth verse, as that the author might have been interrupted in some way and never finished his book as he intended, or that the last leaf was lost from the text which was the source of all our copies, and that some one (Aristion?) later attempted to make good the loss, but while any of the proposed explanations may be possible, it cannot be said that any of them are probable.

Authenticity and Value.— While, as has been said, for many centuries both Matthew and Luke were more used and valued than Mark, this judgment has of late been reversed. As it is the oldest of the three Synoptics, or at any rate preserves the original traditions of the Palestinian Church in their most primitive and unmodified form, it is of the highest value as a record. This value is of course enhanced by the fact of Mark's association with so many of the early leaders of the Church, and still more by the contribution which Peter, in particular, is recognized to have made to the materials employed. The modern critical estimate may be relatively unfair to the value of the other Synoptics, but is doubtless absolutely correct in its high estimate of the authenticity and value of this Gospel.

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MARK, an old English term for a money of account, and in some other countries for a coin. The English mark originated in the 12th century and was valued at $3.33, and the Scotch mark, or merk, of the 19th century was $3.42. In the coinage of the German Empire the mark is a coin of nearly the same value as the English shilling. A mark banco used to be a money of account in Hamburg equal to 37 cents, nearly. The mark was also used as a weight in several parts of Europe, being divided into 24 carats.

MARK, Order of Saint, a Venetian order of knighthood. The doge, as well as the Senate, elected knights of Saint Mark, who enjoyed a pension. Foreigners also, particularly scholars, were elected. Saint Mark the Evangelist was the patron saint of the Venetian Republic.

MARK ANTONY. See ANTONIUS, MARCUS.

MARK TWAIN. See CLEMENS, SAMUEL LANGHORNE.

MARKED TREE, Ark., town of Poinsett County, 40 miles northwest of Memphis, Tenn., on the Frisco Lines. It is within a few miles of Saint Francis Lake and is located in a thriving lumber district. It contains lumber factories, cooperage works and a handle factory. It has also a district high school and two banks. Pop. 2,500.

MARKETS AND RURAL ORGANIZATIONS, Office of. See AGRICULTURE, DEPARTMENT OF.

MARKHAM, märk'ăm, **Albert Hastings,** English admiral and Arctic explorer, cousin of Sir Clements Markham (q.v.): b. Bagnères, 11 Nov. 1841. He entered the navy in 1855, saw active service in the China seas for several years, took part in the Polar expeditions of Adams (1873) and of Nares (1875), and in the latter expedition attained what was then the farthest north, 83° 20′ 26″. With Sir Henry Gorn-Booth he attempted to reach Franz Joseph Land in 1879, but was unsuccessful; in the next year Markham explored the Galapagos Islands. Rear-admiral in 1892 and second in command of the Mediterranean fleet in 1893, he was made a vice-admiral, and later admiral. His last command was at Nore. He retired in 1906. He has written 'The Cruise of the Rosaria amongst the New Hebrides' (1873); 'The Great Frozen Sea' (1878); 'The Voyages and Works of John Davis' (1884); 'A Polar Reconnaissance' (1879); and 'Life of Sir John Franklin' (1891).

MARKHAM, SIR **Clements Robert,** English geographer and traveler: b. Stillingfleet, Yorkshire, 20 July 1830; d. 30 Jan. 1916. He was educated at Westminster School, entered the navy in 1844, accompanied the Franklin Search Expedition of 1850 and then retired from the service. He traveled in Peru in 1852–54 and 1860–61, the second journey being undertaken to get cinchona seeds for planting in India, an experiment described in his 'Peruvian Bark; Cinchona Culture in British India, 1860–1880' (1880). After spending 1865–66 in Ceylon and India, he became assistant secretary in the India Office from 1867–77, and curator of its geographical department in 1868. From 1858–87 he was secretary of the Hakluyt Society, of which he became president in 1890. From 1863–88 he was secretary of the Royal

Geographical Society, and in 1893 became its president. His more important works, several of which were translated into German, are 'Cuzco and Lima' (1856); 'Travels in Peru and India' (1862); 'The Arctic Navy List' (1875); 'Lives' of Columbus, John Davis, Richard Hakluyt, Lord Fairfax, Major Rennell and Sir Leopold McClintock; 'Quichua Dictionary' (1908); 'The Incas of Peru' (1910). He rendered distinguished service to the history of geography and discovery by editorial work for the Hakluyt and other societies. Was created K.C.B. in 1896.

MARKHAM, Edwin, American poet: b. Oregon City, Ore., 23 April 1852. He spent his boyhood on a ranch in central California, herding cattle and sheep, and later graduated from the California State Normal School at San José and from Santa Rosa College. He studied law, but did not practice; subsequently took up educational work and was superintendent and head master of schools in California and principal of the Observation School of the University of California in Oakland. He had for some time been an occasional contributor to some of the leading American magazines, but first gained wide reputation through the publication of his poem, 'The Man with the Hoe,' suggested to him by Millet's picture of the same name. This first appeared in the San Francisco *Examiner* and was later published in a collection entitled 'The Man with the Hoe and Other Poems' (1899). This poem, which had a wide influence and caused much discussion, is intended by the author not merely as a picture of the peasant but as "a symbol of the toiler brutalized through long ages of industrial oppression." His other publications include 'Lincoln and Other Poems' (1901); and 'Field Folk, Interpretations of Millet' (1901); 'The Poetry of Jesus' (1914); 'California the Wonderful' (1914); 'The Children in Bondage' (1915); 'Remarkable Writings of Thomas Lake Harris' (5 vols., 1918).

MARKHAM, William, English colonial governor in America: b. England, about 1635; d. Philadelphia, 12 June 1704. When William Penn obtained a charter for Pennsylvania, he made Markham, a first cousin of his, his deputy. Markham had all rights granted to Penn save that of convoking a legislative assembly. On 3 Aug. 1681 he established a council, later chose the site for Philadelphia and conferred with Lord Baltimore as to the Maryland-Pennsylvania boundary. Penn himself arrived on 27 Oct. 1682, and Markham, whose commission accordingly lapsed, was elected to the council. In 1684–99 he was secretary to the province, in 1686 became land commissioner and in 1689 an auditor of accounts. When in 1691 the territory now constituting the State of Delaware was detached from the province, he was appointed its deputy-governor, and in 1694–99, as lieutenant-governor, administered both this territory and the province.

MARKHOR, mär'kôr or -koor, a remarkable goat (*Capra falconeri*) of the mountains of Afghanistan and northwestern India, where it keeps among the highest wooded valleys, ascending and descending only as compelled to do so by the seasonal changes in the depth of the snow. It is of large size, standing about three feet tall at the shoulders, and is reddish-brown in summer and light gray in winter. "The magnificent beard, extending in the adult males on to the chest and shoulders, and sometimes reaching nearly to the knees, is black in front and gray behind; in the young bucks and the does at all ages it is confined to the chin." The horns are very different from those of other goats, rising straight up from the forehead, spreading sideways, so as to form a V when seen from in front, and spirally twisted. Specimens have measured 50 inches along the spiral keel. Several distinct local varieties of markhor are known to the Himalayan hunters, who regard this animal as one of the most excellent objects of sport in that region of prime game animals. "Unlike the ibex, which keeps to the rugged crags and steep ravines above the limits of the forest, the markhor delights in rocky forests, and although it occasionally comes out into the open glades, it seeks concealment as much as possible." Hence its hunting calls for the greatest skill as well as endurance. This goat is often captured, tamed and crossed with domestic goats; and it is believed to have had some influence in originating the Angora breed. Consult Lydekker, 'Wild Oxen, Sheep and Goats of All Lands' (1898).

MARKIEWICZ, Countess, Irish artist and revolutionist: b. Lissadel, Sligo, Ireland, about 1876. A daughter of the late Sir Henry Gore-Booth, closely connected with a number of English titled families, she has been described by the Dublin bourgeoisie as the stormy petrel of Dublin life. Her husband, a Pole, was employed in the Russian consular service, and both had been prominent figures in the social life of Dublin. Before the countess became involved with the Sinn Fein party she had made a name both as an artist and an actress, and she had frequently acted in her husband's plays at the Abbey Theatre. As a young girl the countess, then Miss Constance Gore-Booth, was presented at court and spent several seasons in London, after which she went to Paris as an art student. She came into prominence during the election in Northwest Manchester in 1908 as an opponent of Mr. Churchill. The Licensing Bill was then the issue and she went to Manchester to plead the cause of the barmaids. Her sister, Miss Eva Gore-Booth (q.v.), a leading English suffragette, was then the secretary of the Barmaids' Political Defence League. In 1911 the countess was charged in Dublin with assaulting a policeman at the breaking-up of a Socialist meeting. During the labor troubles in Dublin in 1912 she came into conflict with the police on several occasions. On the memorable Sunday at the end of August 1912 when Larkin's dramatic arrest was the prelude to wild disorder in O'Connell street, she and her husband came upon the scene when the excitement was at its height, and as Larkin was being escorted to the police station by a body of police with drawn batons. The countess stood up on the car she was driving and led the cheers of the mob for the captured labor leader. For many months afterward, when a large section of the Dublin working classes was in dire poverty caused by the protracted strikes, the countess was a constant attendant at Liberty Hall, the headquarters of the Transport Workers' Union. Here she was engaged in preparing and distributing meals to

the impoverished wives and families of the strikers. A few weeks before the abortive revolution in April 1916 her house was raided by the police, who found a printing plant there and many documents. At the outbreak of the revolt she apparently accompanied the party who captured Saint Stephen's Green, and when the troops got the upper hand she retired with her detachment into the Royal College of Surgeons, one of the principal buildings on the green. Eventually she hoisted the "white flag" and intimated that she would surrender at noon. At the appointed hour the countess marched out of the college, followed by 120 rebels walking two abreast. She was dressed entirely in green, with green tunic, green hat with green feather, green putties and green shoes. She marched to where the opposing force was waiting and, going to the officer in command, saluted, kissed her revolver and handed it over with her bandolier, and announced that she was ready. The men were disarmed and marched off under armed escort to the castle. For complicity in the uprising the countess was sentenced to death by a court-martial, the sentence being afterward commuted to imprisonment for life. She was liberated with the other Irish prisoners in June 1917. She continued her activity in the Sinn Fein party, however, and at the general elections held in December 1918 was returned member of Parliament for a Dublin constituency, being the first member of her sex to be sent to Westminster and the only successful woman candidate. See under IRELAND — REVOLUTION.

MARKING-NUT, an East Indian tree (*Semecarpus anacardium*) of the cashew family, having a fruit the receptacle of which is roasted and eaten. The black juice of the unripe fruit serves with quicklime to make an indelible marking-ink.

MARKINGS OF ANIMALS. See COLORATION, PROTECTIVE.

MARKLE, John, American coal operator: b. Hazelton, Pa., 15 Dec. 1858. He was graduated in the mining engineering department of Lafayette College in 1880 and in the same year was appointed general superintendent of mines of G. B. Markle and Company, his father's firm. Upon his father's death he succeeded him and is now president of the G. B. Markle Company, successor to G. B. Markle and Company, and one of the largest of the "independent" companies in the anthracite coal industry. Mr. Markle is also president and chief engineer of the Jeddo Tunnel Company. He was one of the leading figures and represented the independent operators in the negotiations with President Roosevelt and in the inquiry by the President's commission in connection with the anthracite coal strike of 1902. Mr. Markle is a director of the Industrial Finance Corporation, the Morris Plan Company of New York, member of the American Institute of Mining Engineers, the New York Chamber of Commerce and Franklin Institute, Philadelphia, and a trustee of Lafayette College.

MARKOE, Thomas Masters, American surgeon: b. Philadelphia, Pa., 1819; d. 1901. In 1836 he was graduated at Princeton and in 1841 at the New York College of Physicians and Surgeons. He was appointed to the chair of anatomy in Castleton Medical College, Vermont; in 1852–54 was professor of pathological anatomy at the medical department of the University of the City of New York. He was appointed adjunct professor of surgery at the New York College of Physicians and Surgeons in 1860; became full professor 10 years later and in 1879 was appointed to the chair of the principles of surgery. He published 'Treatise on Diseases of the Bone' (1872).

MARKS' MILLS, Engagement at. On 23 April 1864, a train of 240 wagons, escorted by 1,200 infantry, 400 cavalry and five guns, all under command of Lieut.-Col. F. M. Drake, 77th Ohio Infantry, left Camden, Ark., for Pine Bluff, to get supplies for General Steele's army, then co-operating with Banks' Red River expedition. At 10 A.M. of the 25th, when at Marks' Mills, on the Camden and Pine Bluff road, about eight miles beyond Saline River, Drake was attacked, front and rear, by General Fagan's force of 3,000 men — cavalry, mounted infantry and two batteries — and after a hard fight of more than three hours, during which Drake was severely wounded and had lost 250 in killed and wounded, the entire train, guns and the greater part of the cavalry and infantry were captured. About 300 escaped and made their way to Little Rock and Pine Bluff. Incomplete Confederate returns show a loss of 41 killed, 108 wounded and 144 missing. Fagan's entire loss was about 420. When Steele heard of the disaster he immediately abandoned the idea of joining Banks, left Camden on the night of the 26th for Little Rock, was followed by Sterling Price, had a rear-guard fight at Jenkins' Ferry on the 30th and continued his retreat to Little Rock. Consult 'Official Records' (Vol. XXXIV).

E. A. CARMAN.

MARL, a mixture of carbonate of lime and clay in various proportions. If the lime predominate the marl is called calcareous; clay marl, or argillaceous marl, has a larger proportion of clay. As marl is hard or not it is called indurated or earthy. Even the more solid marls crumble soon on exposure to the atmosphere, and form a paste if dipped in water; they effervesce in acids, because of the presence of carbonate of lime. Marl occurs in masses and beds, is associated with chalk, gypsum, sand, clay or compact limestone and contains important fossil remains. To the presence of carbonate of lime in its composition, marl owes its use in the manufacture of Portland cement and as a fertilizer. Many natural mixtures used as manures are called marls, such as the New Jersey green sand-marls, which contain as their principal constituents clay and greensand and usually only 1 or 2 per cent of carbonate of lime. The latter use of the word is scarcely justifiable, especially as it is sometimes applied, notably in England, to substances containing no lime at all. Marl is accumulating at the present time in many lakes in the glaciated areas of our Northern States, in part as a result of the grinding up of small shells, in part as a result of the activity of algæ known as chara, which cause the deposition of lime carbonate. Marl may sometimes be a direct chemical precipitate. See MINERAL PRODUCTION OF THE UNITED STATES.

MARLATT, Charles Lester, American entomologist: b. Atchison, Kan., 26 Sept. 1863. In 1884 he was graduated at the Agricultural College of Manhattan, Kansas, where he remained assistant professor for two years. In 1889–94 he was assistant entomologist and since 1894 has been first assistant and assistant chief entomologist of the Bureau of Entomology of the Department of Agriculture. He made entomological investigations in Japan, China, Java, etc., for the department in 1901–02. He directed the effort to secure a national law to prevent importation of infested and diseased plants into the United States, which resulted in the Plant Quarantine Act of 20 Aug. 1912. Since 1912 he has served as chairman of the Federal Horticultural Board to supervise the enforcement of the act. Marlatt has had charge of tropical and sub-tropical fruit insect investigations and of branch stations in Florida, Louisiana, California and Hawaii. His publications have been confined to papers and bulletins on professional topics.

MARLBORO, mär'bŭr-ō, Mass., city in Middlesex County, on the Boston and Maine and the New York, New Haven and Hartford railroads, about 28 miles west of Boston and 15 miles east of Worcester. Marlboro was settled in 1656 by a colony from Sudbury, Mass., and four years after was incorporated as a town. In 1890 it was chartered as a city. During King Philip's War (1676) the Indians destroyed nearly the whole town. The chief manufactures are boots and shoes, shoe-making machinery, automobiles and automobile-tires, bicycles, carriages and wagons, lamps, electrical machines and supplies, boxes, hose-pipe, woodenware, cigars and machine-shop products. The principal buildings are the high school, city-hall, Saint Ann's Convent and Academy, a public library, G. A. R. building and a number of churches and schools. The mayor is elected annually and has power to appoint, subject to approval by the council, the police and the members of the street and fire departments. He also appoints the members of the license department. The council elects the members of the health, poor and water departments. The waterworks are owned and operated by the city. Pop. 5,250. Consult Hudson, 'History of the Town of Marlboro, Massachusetts.'

MARLBOROUGH, märl'bŭr-ō, or mâl'-bŭr-ō, **John Churchill,** DUKE OF, English general and statesman: b. Ashe, Devonshire, 1650; d. Blenheim, 16 June 1722. At 12 he became page to the Duke of York (afterward James II), by whom at 16 he was appointed an ensign. He was present at the siege of Tangiers and soon after his return rose to the rank of captain. In 1672 he accompanied the Duke of Monmouth to assist Turenne against the Dutch. At the siege of Maestricht he distinguished himself so highly as to obtain the public thanks of the king of France. On his return to England he was made lieutenant-colonel and his advancement was rapid. He had a regiment of dragoons presented to him and strengthened his influence at court by his marriage with Sarah Jennings, an attendant upon the princess, afterward Queen Anne. In 1682 he obtained the title of Baron of Aymouth and on the accession of James II was sent Ambassador to France and soon after his return created Baron Churchill of Sandbridge and raised to the rank of general. The same year he suppressed the rebellion of the Duke of Monmouth. On the arrival of the Prince of Orange he joined him at Axminster and was rewarded by the earldom of Marlborough and the appointment of commander-in-chief of the English army in the Low Countries. The following year he served in Ireland, where he reduced Cork, Kinsale and other places. In 1691 he was suddenly dismissed from all his employments and committed to the Tower on the charge of high treason, but soon obtained his release; though it appears that the suspicions against him were not without foundation. On the death of Queen Mary he was made a privy councillor and appointed governor to the young Duke of Gloucester; and in 1701 was created by King William commander-in-chief of the English forces in Holland and Ambassador Plenipotentiary to the States-General. On the accession of Queen Anne in 1702 he was created captain-general of all the forces at home and abroad and sent Plenipotentiary to The Hague. There he was also made captain-general by the States. In the campaign of the same year he drove the French out of Spanish Guelders and took Liège and other towns, for which he was created Duke of Marlborough. In 1704 he stormed the French and Bavarian lines at Donauwörth, and in the same year, with Prince Eugene, gained the victory of Blenheim (13 August) over the French and Bavarians, headed by Marshal Tallard and the Elector of Bavaria. The nation testified its gratitude by voting him the manor of Woodstock and Blenheim Palace, one of the finest seats in the kingdom. In the campaign of 1707 his antagonist was the famous Duc de Vendôme, over whom he gained no advantage; and on his return he found that his popularity at court was on the decline, this being said to be due to his avarice. In 1708, with Prince Eugene, he gained the battle of Oudenarde. In 1709 he defeated Marshal Villars at Malplaquet (11 September) though at a cost ill repaid by the capture of Mons, and in 1710 with Prince Eugene gained another victory over Villars. During his absence a new ministry, hostile to himself, was chosen, and on his return his command was taken from him and a prosecution commenced against him for applying the public money to private purposes. He went in disgust to the Low Countries in 1712, but returned a short time before the queen's death, and on the accession of George I was reinstated in the supreme military command. Consult Coxe, 'Memoirs of the Duke of Marlborough' (1847–48); Alison, 'Military Life of the Duke of Marlborough' (1879); Saintsbury, 'Marlborough' (1879).

MARLBOROUGH, N. Y., town of Ulster County, situated on a high bluff on the right bank of the Hudson, 65 miles north of New York. Capt. Annivy Smith, of Revolutionary fame, lived here and his house was shelled by the British in 1777. The region is noted for its small fruits, especially the Marlborough raspberry. Pop. of the town 2,700; of the borough about 1,000.

MARLBOROUGH, New Zealand, the northeastern provincial district of South Island, bounded by the sea and the provincial district of Nelson. Its extreme length is 130 miles,

breadth 60 miles; area, 4,753 square miles. The coast is deeply indented by bays and natural harbors, from which the hills rise abruptly, clothed with magnificent forests. The district is generally hilly or mountainous, with splendid scenery. The amount of arable land is restricted; in the south are the Wairau Plains, one of the finest sheep tracts in New Zealand. Mining is carried on, gold, copper and coal being found. Blenheim, the capital, is connected by rail with the seaport of Picton on Queen Charlotte Sound. Pop. 17,612.

MARLIN, Tex., city and county-seat of Falls County, on the Houston and Texas Central and the International and Great Northern railroads, about 150 miles north of Houston and 26 miles southeast of Waco. It is situated in an agricultural region in which cotton is the chief product. The industrial establishments include a large cotton-seed-oil mill, three cotton gins, a cotton compress, a large brick plant, ice and electric-light plant, planing mill and marble works. The trade is in cotton, livestock and various kinds of vegetables and fruits. Marlin has two hot water artesian wells which have an average depth of 3,350 feet, with a temperature of 147° F. The waters possess medicinal properties which attract a large number of health seekers to the city. Some of the principal buildings are a central school building, fine hotels, sanatoriums, bathhouses, opera-house, modern business houses and courthouse. Pop. 6,000.

MARLIN, a sportsman's name for the godwits (q.v.).

MARLINGSPIKE, or **MARLINE SPIKE,** an iron pin tapering to a point, and principally used by sailors to separate the strands of a rope in splicing or knotting. A large wooden pin used for the same purpose is called a *fid.* A bird, the jæger or boatswain, of New England, bears the same name, in allusion to the pointed tail-feathers.

MARLITT, E. See JOHN, EUGENIE.

MARLOWE, Christopher, English poet and dramatist: b. 1564; d. 1593. In 1583 he took the A.B. degree at Bene't College, Cambridge, and in 1587 the degree of M.A. Perhaps in the same year, the first part of his 'Tamburlaine' was acted in London; and the rest of his life was spent in active connection with the theatres. His life seems to have been somewhat dissipated and the daring of his theological opinions gave color to an accusation of atheism. In 1593 he was killed in a tavern broil and was buried at Saint Nicholas, Deptford.

Numerous plays have been assigned to Marlowe, including a share in the three parts of 'Henry VI'; and he may very likely have had some part in others besides the following, which can with certainty be ascribed to him: 'The Tragedy of Dido,' of uncertain date of acting, printed 1594; 'Tamburlaine' (two parts), acted 1587–88, printed 1590; 'Dr. Faustus,' acted 1588–89, printed 1594; 'The Jew of Malta,' acted about 1590, printed 1594; 'Edward II,' acted 1591, printed 1594; 'The Massacre of Paris,' acted after 1591, printed about 1595. His 'Hero and Leander' was left incomplete at his death and was finished by George Chapman and published in 1598. Marlowe's plays attained a sudden and great popularity and his poetic reputation is testified to by numerous tributes from his contemporaries. Marlowe's dramatic activity came at a time of great emotional stir and stress. In England the ideas and ideals of the Renaissance and the Reformation had finally gained the ascendency over those of the Middle Ages. The struggle with Spain, which was just ending in the destruction of the Armada, had brought a triumphant consciousness of national greatness. From this newly-discovered England as well as from the newly-discovered America and the rediscovered world of Greece and Rome, came countless incentives for multiform activities. In literature as in life opportunity seemed boundless, experiment and innovation easy, voyages of discovery sure of rich reward. The drama had already become in some measure an expression of this national activity, but it still awaited the services of great literary genius. After two generations of precarious struggle, the professional companies had become firmly established in the public theatres and it was already plain that the main development of the drama was henceforth to be popular and professional rather than scholarly and amateur. In comedy, indeed, the plays of Lyly and Peele had already supplied refinement and a literary flavor, but in the popular drama in the main, and in tragedy in particular, there was neither refinement nor poetry.

Marlowe created English tragedy anew. He threw aside Senecan traditions and devoted himself to meeting the demands of the London theatres, but the prologue to his first play was a declaration of reform, announcing the adoption of blank verse, heroic themes and "high astounding terms." His themes were novel, and his treatment of them seems to have been dictated by a conception of tragedy formed independently of his predecessors,— the heroic struggle of a great personality doomed to inevitable defeat. 'Tamburlaine' is hardly a tragedy at all but rather a chronicle of the hero's greatness; but in 'Dr. Faustus' and 'The Jew of Malta,' heroes with ambitions as boundless and passionate as Tamburlaine's are overwhelmed in the end by the limitations that forever bound human aspiration. These plays mark the formation of the Marlowean type of tragedy, often imitated and long influential in the English drama. A protagonist distinguished by great passions and many crimes absorbs the interest of a series of scenes, brutal and sensational, full of violent action, ranting declamation, bloodshed and villainy affording opportunity for elaborate theatrical spectacles and adorned by passages of profound intellectual suggestiveness and extraordinary beauty of diction and melody. 'Edward II,' the most mature of his plays, illustrates these characteristics and also testifies to his growing power both as a playwright and as a poet. The characterization is less melodramatic, more varied and more human than in the earlier plays: the structure more coherent and organized; the style less bombastic, more even and more dramatic. Shakespeare, who clearly imitated Marlowe in 'Richard III' and produced 'Richard II' in rivalry of 'Edward II' did not in these two plays surely surpass his master.

Marlowe's faults and deficiencies are apparent and they cannot all be credited to the

immaturity and experimental nature of his art. The banalities that mar his noblest scenes and the absurdities that appear in every phase of his work, theatrical, dramatic or poetic, would doubtless have disappeared in the rapid development of dramatic art which the next 30 years witnessed. But there are no indications that, had Marlowe's life been prolonged, he would ever have excelled in humor or the individualization of character. His achievement is, nevertheless, among the most remarkable and enduring of the Elizabethan era. His poetry remains forever impressive with its fine impetuosity, its splendors of diction and melody. His tragedies, of immense influence on the theatre of his day, continue to rank among the greatest of English literature in their expression of passionate ambition and aspiration. He was the first great English dramatist, and he prepared the way for Shakespeare. See FAUST, DR.; JEW OF MALTA, THE.

Bibliography.— The best collected editions of his works are by Rev. Alexander Dyce (1850 and 1870), and by A. H. Bullen (3 vols., 1885). His four tragedies are in one volume of Mermaid Series of Old Dramatists with introduction by J. A. Symonds. For biography and criticism: Ward, A. W., 'History of Dramatic Literature' (Vol. I); Fleay, F. G., 'Biographical Chronicle of the Drama' (Vol. II); Ingram, J. H., 'Christopher Marlowe and His Associates'; Fischer, O., 'Zur Charakteristik der Dramen Marlowe's' (Munich). Marlowe's life has been the theme of two modern tragedies, R. H. Horne's 'The Death of Marlowe' (1870), and Miss Josephine Peabody's 'Marlowe' (1901).

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MARLOWE, Julia (MRS. SOTHERN), American actress: b. (Sarah Frances Frost), Caldbeck, Cumberlandshire, England, 17 Aug. 1870. She came with her parents to the United States in 1875. In 1882 she joined the Juvenile Opera Company, which presented 'Pinafore,' 'The Chimes of Normandy' and other light operas, in which she was known as Frances Brough. Subsequently she took a child's part in 'Rip Van Winkle.' She then retired, studied in New York for three years and then made her metropolitan début as Parthenia in 'Ingomar.' Her later rôles include Viola in 'Twelfth Night'; Rosalind in 'As You Like It'; Highland Mary in 'For Bonnie Prince Charley' (1897); Barbara Frietchie in the play of that name by Clyde Fitch (1899), and Charlotte Durand in Cable's 'Cavalier' (1902). Other plays in which she has taken the title rôles are 'Colinet' and 'When Knighthood was in Flower.' On 28 May 1894 she was married to Robert Taber, who had been her leading man in her first appearance in 'Romeo and Juliet' in 1888. They starred together for a season, but owing to a disagreement were later separated and in 1900 Mrs. Taber secured a divorce. The next great success was as Barbara Frietchie in Clyde Fitch's play. In 1904 she joined E. H. Sothern, and for several years they were joint stars in Shakespearean rôles. In 1911 they married, and in 1916 Mrs. Sothern retired from the stage. Their presentations of Shakespearean plays are reckoned as some of the best ever given in America. Consult Strang, 'Famous Actresses of the Day in America' (Boston 1899); Browne and Austin, 'Who's Who on the Stage' (New York 1906).

MARMADUKE, John Sappington, American soldier: b. Saline County, Mo., 14 March 1833; d. Jefferson City, Mo., 28 Dec. 1887. He studied at Yale and Harvard and graduated from West Point in 1857, and served in the United States army in the West. At the outbreak of the Civil War he entered the service of the Confederate States and rose to the rank of major-general. In 1864 he was captured and was not released until after the close of the war, when he went abroad for a time, and on his return engaged in business and also in journalism. He was defeated for the governorship of Missouri in 1880, but in 1884 was elected and served until his death.

MARMALADE, a jellied or gelatinous preparation made from quinces, peaches, apricots or oranges and portions of their rinds, with a mixture of sugar and spice. It is made like the ordinary jams, poured out warm into pots or jars and sold as a confection. The marmalade tree (*Tucuma mammosa*) is of the star-apple family, producing a large egg-shaped drupe, tasting like marmalade.

MARMETTE, Joseph, Canadian novelist: b. Montmagny, Quebec, 1844; d. 1895. After receiving a good general education he determined to devote himself to literature. He wrote several historical novels dealing with the main events in French-Canadian history. These include 'Charles et Eva' (1867); 'François de Bienville' (1870); 'L'Intendant Bigot' (1872); 'Le Chevalier de Mornac' (1873), and 'Le tomahawk et l'épée' (1877).

MARMIER, Xavier, French author: b. Pontarlier, Doubs, 24 June 1809; d. Paris, 11 Oct. 1892. He engaged in journalism and later traveled extensively in Switzerland, Holland, Germany, Russia, Algeria, America and the East. In 1835 he accompanied the scientific voyage of the *Research* to the Arctic regions and then acquired a wide knowledge of the Scandinavian and Finnish languages and customs. In 1839 he became professor of foreign literature at Rennes and in 1841 occupied a position under the Minister of Public Instruction. In 1846 he was appointed librarian at Saint Geneviève in Paris and in 1870 was elected a member of the Academy. Among his publications are 'Histoire de l'Islande' (1838); 'Langue et Littérature Islandaises' (1838); 'Histoire de la littérature en Danemark et en Suède' (1839); 'Lettres sur la Russie, la Finlande et la Pologne' (1843); 'Du Rhin au Nil' (1846); 'Lettres sur l'Amérique' (1852); 'Voyage en Suisse' (1861); 'Voyages et Littérature' (1888), and the novels 'Les fiancés du Spitzberg' (1858); 'Gazida' (1860); 'Cimarosa' (1867); 'Les drames du cœur' (1868); 'Une grande dame russe' (1876), etc.

MARMION. Scott's 'Marmion,' published 1805, is the second of his metrical romances, and the first — after the preliminary experiment of the 'Lay of the Last Minstrel' — in which he developed the full possibilities of the form. Because of the success of the earlier poem, he was offered £1,000 for this one before he had begun to write it — a circumstance

which enabled Byron to barb his satire with the taunt:

"And think'st thou, Scott! by vain conceit perchance,
On public taste to foist thy stale romance,
Though Murray with his Miller may combine
To yield thy muse just half a crown per line?"

Like most of Scott's fiction, in prose or verse, the story of 'Marmion' is based on the fundamental impulse to revivify the past, especially in connection with the historic associations of picturesque scenes. Hence he weaves a romance about persons, some historic and some imaginative, but always with an eye toward the climax, the account of the battle of Flodden Field. It is significant, too, that the famous scene describing the quarrel between Marmion and Douglas (canto vi) was an afterthought, due to a suggestion from one of Scott's friends that he should plan Marmion's journey from England to Edinburgh so as to introduce the Douglas castle of Tantallon. Critical opinions have varied concerning the romantic plot of this poem, and Scott himself spoke severely of his having based it in part on the crime of forgery, characteristic "of a commercial rather than a proud and warlike age." But there can be no difference of view as to the splendid movement and glow of the more stirring scenes of the story — those of the kind in which Scott's genius was always at its best — especially the account of the battle of Flodden, culminating in the death of Marmion. The work also contains some interesting personal poetry, in the epistles, addressed to different friends, which Scott prefixed to the several cantos, and (in canto v) one of his most popular narrative ballads, 'Lochinvar.'

RAYMOND M. ALDEN.

MARMOL, José, hō-sā' mär-mōl', Argentine author: b. Buenos Aires, 5 Dec. 1818; d. there, 12 Aug. 1871. He was a pronounced Democrat, was banished by Rosas, led the opposition against that dictator and on its successful termination became senator and librarian of Buenos Aires. A fervent orator Marmol is better known as the author of 'La Amalia' (1866), a historical novel dealing with Rosas' dictatorship, of the popular patriotic poem 'El 25 de Mayo de 1843,' and of the dramas 'El poeta' (1842); 'El Peregrino' (1846) and 'El Cruzado' (1851). 'La Amalia' has long been familiar to European readers through French and German translations. An English translation has appeared recently (New York 1919).

MARMONT, Auguste Frederic Louis Viesse de, ō-gust frä-dē-rēk loo-ē vē-ēs dē mär-môñ, Duke of Ragusa and Marshal of France: b. Chatillon-sur-Seine, France, 20 July 1774; d. Venice, 2 March 1852. He entered the army as a lieutenant of infantry in his 15th year. In 1792 he changed to the artillery, and at Toulon became acquainted with Bonaparte, who chose him for his aide-de-camp. For several years after 1805 he was military and civil governor of Dalmatia, where he initiated important public works. Being called to aid in the Austrian campaign in 1809 he assisted so efficiently that Napoleon made him a marshal and governor-general of the Illyrian provinces. He was again called upon in the Spanish campaign of 1811, was severely wounded at Salamanca (q.v.) and laid up for some time. In the campaign of 1813 he held the command of an army corps in Germany, and fought in the battles of Lutzen, Bautzen and Dresden. In 1814 he fought a final battle under the walls of Paris, but opposition appearing fruitless surrendered to the allies. This proceeding was one main cause of Napoleon's immediate abdication, and brought Marmont into favor with the Bourbons. After the Restoration Louis XVIII made him a peer of France, but he was compelled to withdraw from Paris by the Revolution of 1830, and his name was struck off the army list.

MORMONTEL, Jean François, zhŏn fränswä mär-môñ-tĕl, French writer: b. Bort, Limousin, France, 11 July 1723; d. Abbeville, Eure, 31 Dec. 1799. He was educated for the Church, but turned to letters, and became a journalist and dramatist at Paris. In 1758–59 he edited *Le Mercure*, and in 1763 was elected to the Academy. He wrote tragedies, including 'Denys le Tyran' (1748) and 'Aristomène' (1749); 'Contes moraux' (1761), and the works of fiction 'Béhsavie' (1767) and 'Les Incas' (1778). His 'Poétique Française' (1763) and 'Eléments de Littérature' (1787) have perhaps a more permanent worth. A collected edition of his writings appeared in 1786–87. In 1771 he was appointed historiographer of France, and in 1783 was made secretary of the French Academy.

MARMORA, mär'mō-ra, or MARMARA, Sea of (anciently *Propontis*), an inland sea, lying between southeastern Europe and the westernmost part of Asia, communicating with the Mediterranean by the narrow strait called the Dardanelles, and with the Black Sea by the Bosporus. Length from Gallipoli to the head of the Gulf of Izmid, 170 miles; greatest breadth, which is near the centre, about 45 miles; average depth, over 600 feet; maximum depth, 4,000 feet. The gulfs of Izmid and Moudania, on the Asiatic side, are the chief indentations. The largest of several islands is Marmora, famous for its quarries of marble and alabaster, situated near its western end; at the eastern end, on the Asiatic coast, and not far from Constantinople, is a group called the Princes Islands. A current sets from the Black Sea into the Sea of Marmora, which in turn runs into the Archipelago. The tides are hardly perceptible and the navigation is easy.

MARMOSET, a small American monkey of the family *Hapalidæ*. They inhabit the Brazilian forests, possess long, non-prehensile tails, have a thick wooly fur and bear a close resemblance to squirrels in appearance and movements, having long hind legs and penciled ears. They are notable, further, for the relatively large size of the brain and the few teeth (32), likening the family more to the monkeys of the Old World than to those of the other American family (*Cebidæ*). They are favorite pets, not only on account of their quaint prettiness, but because of their small size, their gentleness and intelligence; but they are exceedingly delicate and rarely survive a change of climate. Their food is varied. The family includes many species which fall into two divisions — the genus *Hapale* and the genus *Midas*. The former contains the typical marmosets, or ouistitis, as the French call them, of which one species (*H. jacchus*) has long been a familiar pet; and the latter, the silky marmo-

sets or tamarins, which are larger and more varied in their colors and in their ornamental tufts and crests. They also differ in their teeth and are without ring-colors on the tail. The best-known species is the marikina (*M. rosalia*), The pinché (*M. œdipus*), found at the Isthmus of Panama, has bushy gray hair on the head, giving a quaint "old man" appearance.

MARMOT, a large ground-squirrel of the genus *Arctomys,* having terrestrial habits, rather coarse fur, no cheek-pouches, short limbs and powerful digging claws. In size they vary from about 15 to 25 inches in length, the tail adding from 3 to 12 inches. Several species inhabit the northern parts of the world, in southerly climates keeping themselves mostly upon mountain heights, but farther north inhabiting lower levels, preferring open or thinly wooded plains. All dig and dwell in burrows, some species gathering into extensive colonies, the hillocks about the mouths of the burrows forming communities similar to the "towns" of the prairie-dogs; while other species dwell in families far apart from one another. They feed upon herbage and grow very fat in the autumn preparatory to hibernation during the cold months, when their dormancy is complete. Their underground sleeping-chambers are warmly furnished with dry leaves and hay. The European marmot (*A. Alpinus*) is found in plenty on the Alpine range, equals a rabbit in size and is light brown in color. It lives immediately below the snow line, and subsists on vegetables, insects and roots. They come forth from their burrows during the month of April, and are said to be readily tamed. The bobac, another European species (*A. bobac*), inhabits Poland, Russia and all northern Asia. A third species is found in the Himalayan ranges; and a fourth (*A. caudatus*), the largest and handsomest of the family, dwells in the valleys of their southerly slopes. These little animals are of great value to the wandering natives of northern and central Asia, who utilize both their skins and flesh. America has two marmots, one of which is the siffleur or whistler of the tops of the northern Rocky Mountains, and the other the familiar Eastern woodchuck. The former takes its name from the loud eerie whistle with which it wakes the echoes of the crags about the lone pastures above timber-line, where it makes its home; it was of great service to the mountain Indians. Other species or varieties occur in the southern mountains of the Western States. The woodchuck, or ground-hog (*A. monax*), is a heavy, broad-headed, grizzled animal of the woods and fields, yellowish to whitish gray in color, blackish on the back and crown and chestnut on the belly; with the feet and tail brownish black. It abounds throughout the whole country east of the dry plains, and flourishes in spite of civilization, as the farmers' meadows and gardens supply it with an increased supply of good food, and mankind thins out its worst enemies, such as wildcats, foxes, weasels, the larger serpents and birds of prey; none of these save the first is much to be feared by the full-grown woodchucks, but may kill many of the young. As a result the animals have become unpleasantly numerous in some districts of the Eastern States, where their depredations upon gardens and certain plantations, as of lettuce and celery, are often serious. Consult Lydekker, 'Royal Natural History,' (Vol. III 1895); Stone and Cram, 'American Animals' (1902).

MARNE, märn, France, a river, the chief affluent of the Seine, rising in the plateau of Langres, flowing northwest past Châlons to Epernay, thence westward, joining the Seine at Charenton, four miles above Paris. Its length is 326 miles, 126 of which are navigable to Saint Dizier. It is connected by canals with the Rhine, the Aisne and the Seine. The Marne was the crucial fighting line of the Western Front during the Great European War, 1914–18. During a six-days battle from 5 Sept. 1914 the march of the Germans on Paris was checked along its banks. Fighting continued between the Aisne and the Marne until the Germans began their fifth drive on 15 July 1918. American troops counter-attacked, drove the German troops back across the rivers, and with the Allied troops continued the onslaughts which led to the German request for the armistice which ended the war 11 Nov. 1918. See WAR, EUROPEAN.

MARNIAN EPOCH, name given to the period known in France as the Gallic, in England the late Celtic and in Switzerland as La Tène. It extends from about 500 B.C. to the conquest of Gaul by Julius Cæsar. It is named Marnian from the French department of the Marne where the richest deposits of the period have been found.

MAROCCO, mą-rok'o. See MOROCCO.

MARONITES, măr'ō-nīts, a sect of Eastern Christians, whose origin was a consequence of the Monothelite controversy. In the 7th century the opinion that Christ, though he united in himself the divine and human natures, had but one will arose among the Eastern nations. But when their last patron, the Emperor Philippicus Bardanes, was deposed and exiled in 713, the Monothelites were condemned and banished by his successor, Anastasius. The remnant of this party survived in the Maronites (so named from their founder, Maron)—a society of monks in Syria, about Mount Lebanon, which is mentioned as early as the 6th century. Another monk, John Maro, or Marum, also preached Monothelitism there in the 7th century. Regarded as rebels by the Melchites (q.v.), or Christians who adhered to the opinions of the emperor, they became, in the country of Lebanon, which is now called Kesrawan, a warlike mountain people, who defended their political as well as their religious independence boldly against the Mohammedans, and who even now, under the Turkish government, resist the payment of a tribute, like the Druses. The political constitution of the Maronites is that of a military commonwealth. Governed by their ancient customary rights, defended from external attacks, they support themselves among the mountains by husbandry and the produce of their vineyards and mulberry-trees. The revenues of all their orders of ecclesiastics are very small, but a common spirit unites them, and in simplicity of manners, temperance and hospitality they resemble the ancient Arabians. Revenge for murder is permitted among them, and as a sign of nobility they wear the green turban. Their Church constitution resembles very much that of the old Greek Church. Since the 12th century they have several times submitted to the Pope and joined the Roman Catholic

Church, without giving up their own peculiarities. At last Clement XII induced them to accept the decrees of the Council of Trent at a synod held in 1736 at their convent of Marhanna. After this synod their priests still retained the right to marry, after the manner of the Greek Church; and they continued to administer the sacrament under both forms. The use of the Arabic language was preserved in the church service. Mass was read only in the ancient Syriac. Their head is called the patriarch of Antioch, although his residence is in the monastery of Kanobin, upon Mount Lebanon; and he gives an account every 10 years to the Pope of the condition of the Maronite Church. Under him are the bishops and other clergymen, who form seven degrees of rank. In Kesrawan are over 200 Maronite convents and nunneries, containing in all from 20,000 to 25,000 members who profess the rule of Saint Anthony and devote themselves to agriculture and gardening. Since 1584 there has been a Maronite college established at Rome for the education and training of their clergy. At present the Maronites are supposed to number about 300,000, and these are distributed into 150 parishes throughout Syria, Palestine, Egypt and Cyprus. In consequence of the sanguinary conflicts between the Maronites and Druses, June 1860, both communities are now subject to one governor appointed by the Porte, with the title of governor of the Lebanon. Consult Bliss, F. J., 'Religions of Modern Syria and Palestine' (1912). See DRUSES.

MAROONS, the name given to runaway negro slaves in Jamaica and in some parts of South America. The name seems to be equivalent to mountaineers, being derived from Spanish, *cimarron,* a fugitive negro or maroon, from *cima* (same as French *cime*), a summit or hilltop. In many cases runaway negroes, taking to the forests and mountains, rendered themselves formidable to the colonists and sustained a long and brave resistance against the whites. When Jamaica was conquered by the English in 1655 about 1,500 slaves retreated to the mountains. They continued to harass the island till 1795, when they were finally reduced by the aid of bloodhounds. Some of them were removed to Nova Scotia, and afterward to Sierra Leone. Consult Dallas, 'History of the Maroons.'

MAROQUIN, măr-ō-kēn'. See MOROCCO (leather).

MAROS, mo'rosh, river of Hungary. It rises in eastern Transylvania and flows westward for about 550 miles, joining the Theiss at Szegedin to form the Danube. Its watershed is about 30,000 square miles. It is navigable to Karlsburg, about 300 miles.

MAROT, Clement, French poet: b. Cahors, Quercy, winter of 1496–97; d. Turin, 1544. His father was *escripvain* or historiographer to Anne of Brittany. He went to Paris in 1506, was educated at the university there and studied for the bar. Through his father's interest, he entered the service of Francis I; and in 1519 was attached to the suite of Margaret d'Angoulême, the king's sister. In the battle of Pavia he was wounded and taken prisoner, but on his return to Paris became a member of the royal household. Imprisoned once as a Protestant heretic, and coming again into serious risk, he fled to Navarre and to Italy; returning, he had to flee finally in 1543. Being as much a freethinker as a Calvinist, he found no shelter in Geneva, whither first he betook himself, and went to Turin, where he died. His early poems are stiff; his later ones are almost unsurpassed for ease and grace, in which qualities his only rival is La Fontaine. He wrote many rondeaux, epigrams, epistles and ballads; also the poem 'L'Enfer.' His famous translation of the Psalms in poetry — superior to the inadequate French prose translation of the Scriptures at that time — is said to have promoted the cause of the Reformers and was sung at the court and was widely popular in the country. Consult Morley, Henry, 'Clement Marot, and other Studies' (London 1871); Tilley, A. A., 'Literature of the French Renaissance' (Vol. I, New York 1904).

MAROT, Helen, American labor leader: b. Philadelphia, 1865. She became interested in labor problems in her native city and after a few years of activity in labor circles there removed to New York. In the latter city she became executive secretary of the Woman's Trade Union League. Meanwhile she made important investigations into conditions surrounding child labor in New York. She has published 'Handbook of Labor Literature' (1889); and 'American Labor Unions' (1914).

MAROZIA, mą-rō'zī-ą, Roman lady of infamous reputation, known for her influence at the papal court: d. Rome, 938 A.D. She was the daughter of Theodora (q.v.). She deposed Pope John X, and probably caused his death. As mother of John XI and grandmother of John XII and Leo VII, she exercised great influence on the political affairs of her time in Italy. She had more ability than character, but repented and died in a convent.

MARQUAND, mär-känd', **Allan G.,** American archæologist: b. New York, 10 Dec. 1853. In 1874 he was graduated at Princeton University and studied subsequently at the universities of Berlin and Johns Hopkins. In 1881–83 he was engaged as tutor and lecturer and from 1883 to 1905 was professor of archæology and the history of art at Princeton. Since 1905 he has been professor of art and archæology at the same institution. Since 1890 Dr. Marquand has also been director of the Princeton Museum of Historic Art, and in 1896–97 was professor of archæology at the American School of Classical Studies, Rome. Since 1885 he has been associate editor of the *American Journal of Archæology.* Dr. Marquand is the author of 'Greek Architecture' (1909); 'Della Robbias in America' (1912); 'Luca Della Robbia' (1914); joint author of 'History of Sculpture' (1896–99), and archæological articles in various journals.

MARQUAND, Henry Gurdon, American banker and philanthropist: b. New York, 11 April 1819; d. 26 Feb. 1902. He was educated in Pittsfield, Mass., and for 20 years was in the real estate business, afterward becoming a banker and acquiring an interest in various railways and other commercial enterprises. He was a generous patron of the Metropolitan Museum of Art, to which he gave valuable paintings, etc., and among his other benefactions are a pavilion to Bellevue Hospital and a gymnasium and a chapel to Princeton University.

MARQUE, märk, **Letter of,** a commission granted to the commander of a merchant ship or privateer to cruise against and make prizes of the enemy's ships and vessels, either at sea or in their harbors, under pretense of making reprisals for injuries received. The ship so commissioned was also called a letter of marque or mart. In the naval history of the 16th and 17th century, privateering was common, but tended to degenerate into piracy, any state at war, when hard pressed, being willing to issue letters of marque to anybody who would prey upon their enemy. The term is in disuse except with historical reference, as no government has issued such licenses since the Declaration of Paris, at the close of the Crimean War in 1856.

MARQUESAS, or **MARQUEZAS** (märkā'sās), or **MENDANA** (měn-dā'ña) **ISLANDS,** or **LES MARQUISES,** Polynesia, an island group in the south Pacific Ocean, lat. 8° to 11° S; long. 138° 30′ to 141° W., belonging to France since 1842 and composed of 12 islands and islets divided into two groups, the northern and southern, with a total area of 480 square miles. The largest islands are Nukahiva, or Marchand, and Hivaoa, or Dominica. The coasts are generally inaccessible, rising from water like walls; but in Nukahiva there are some excellent natural harbors. The islands are generally high, some of their mountains reaching an elevation of over 4,000 feet; the intervening valleys are fertile, picturesque and copiously watered by streams which form numerous cascades. The principal food productions are pulse, yam, cocoanuts, sugar-cane, cotton and bamboo; hogs are also numerous. The men are well-formed, active, powerful and all tattooed. The women have regular features, good complexions, fine teeth and neat hands, and are the finest of the sex to be met with in Polynesia. The people of these islands were formerly cannibals and though this practice has been discontinued cruelty and ferocity are prevailing characteristics, and the efforts of the missionaries have met with but little success. The Marquesas were discovered in 1595 by Alonza Mendaña de Neyva. They were subsequently visited and described by Cook and the Forsters in 1774, when Hood's Island was added to the group. In 1797 three more were discovered by Ingraham, an American captain, and were named Washington Islands. In 1842 they acknowledged the sovereignty of France. The population steadily decreased during the 19th century, in 1876 being 5,420; in 1910, 4,000; in 1915, 3,424.

MARQUETRY, mär'ket-rĭ (French, *marqueterie*), inlaid cabinet-work in which thin slices of different colored wood, sometimes of ivory, pearl, shell or metal, are inlaid on a ground usually of oak or fir, well seasoned to prevent warping. The marquetry of Italy possesses much artistic merit. The work of Foulet, Oeben and Riesener in France during the 18th century was conspicuous and their manufactures are still sought by lovers of antiques. (See INLAYING; MOSAIC; PARQUETRY). Consult Jackson, F. H., 'Intarsia and Marquetry' (1903).

MARQUETTE, Jacques, French Jesuit missionary and explorer: b. Laon, France, 1 June 1637; d. near site of the present Ludington, Mich., 18 May 1675. His family was of good social position in his native city. It is evident that he must have had the advantages of early education, as he entered the Jesuit College at Nancy, in 1654, with the intention of joining the Society. He studied and taught, as Jesuit scholastics usually do, at Pont-à-Mouson, Rheims, Charleville and Langres. In 1666 he was to go as a missionary priest to New France. He arrived at Quebec, 20 Sept. 1666. In the next month he began his preparation for life among the savages by the study of the Indian languages, at Three Rivers, under the direction of Father Druillettes who knew all the ways of missionary life. He spent two years in the wilderness, with Father Druillettes' log house as his "home," learning the forest and lake and living, as near as possible, the life of the redmen. In 1668, Father Marquette was ready to begin work among the Ottawas. From Montreal, he went to Sault Sainte Marie, known to-day as the "Soo," then marked in French records "Santa Maria" of the Algonquins. The term "Ottawa," as used by the Jesuits, included the Sioux, the Miamis, the Sacs, the Winnebagoes, Foxes, Pottawatomies, Chippewas, Beavers, Creeks, Ottawas, Hurons, Menominees and Illinois. From Sault Sainte Marie, he was sent to La Pointe Mission in Lake Superior. The place selected for his work was at Chequamegon Bay. From 14 Sept. 1669, until 1671, when the mission was given up because of the inability of the Hurons to defend themselves against the Sioux, he served and learned much. Father Marquette probably did not foresee that this abandonment meant that there would be no Christian mission on Lake Superior "for over a hundred years"; as the Rev. Samuel Hedges remarks, "There can be little doubt that the Blackrobe sat in their council circle, and took part in their deliberations, which determined their flight." He says Marquette joined the Hurons in their rush to the south toward the Island of Mackinac, then Machillimackinac. The little town of Saint Ignace — named in honor of the founder of the Jesuits, Saint Ignatius Loyola, on Moran Bay,— claims the honor of being the spot where Father Marquette built his chapel in 1671. Mackinac Island disputes with Saint Ignace the right of precedure, but there can be no doubt, whether a previous mission existed in Mackinac Island or not, that it was from Saint Ignace, Father Marquette set out in his search for the Mississippi,— of the existence of which traditions and rumors lived among the tribes.

The quarrels that had deflected the course of Sieur René de la Salle did not, in the end, prevent him from tracing the course of the Mississippi to the sea, and De Soto, earlier, had crossed the valley near its mouth, but it was Marquette who, having equipped himself with the Indian lore, added to such scientific knowledge as he could acquire, actually discovered the wonderful stream of the Indian legends. Count Frontenac was the devoted friend of La Salle, but he could not overcome the jealousies raised by the clashing of commercial interests. It has been the fashion to accuse the Jesuits of merely mercenary motives in opposing the opening of the territory of their missions in New France to all trappers and traders. It is plain, human,— putting aside

all imputed motives,— that Jesuits like Jogues, Albourg, Druillettes and a hundred others did not lead lives of unspeakable deprivations and amazing self-sacrifice merely for temporal gain for their Society or their country. When it is known that they were French, it is at once known that they were patriots. And if the Jesuits opposed the mercantile designs of the supporter of La Salle, it must be admitted, in the light of after events, that they were safeguarding the interests of their charges. The fate of Jogues and of René Goupil did not deter men like Marquette. It only made them more anxious to teach Christianity or to die. Marquette, like all the missionary priests of his Society, held that it was his duty to contribute to the knowledge of the world. Whether it was the analysis of a dialect or the bending of a river, the Jesuit made each his duty, always remembering the motto of his Society, "To the greater glory of God." Marquette had kept in mind all the talk about the great river and the natives that dwelt upon its banks. He was sent, he believed, as one who must teach all nations, and he did not disdain any knowledge that might help him to this, valuing the knowledge itself, for every Jesuit was a student both of nature and of books. Louis Joliet had started to become a Jesuit, but had, instead, become a fur trader. When he was commissioned by the governor of New France, to look for the great stream that, it was rumored, opened into the Pacific, Father Marquette, who earnestly desired it, was sent by his superiors to accompany him. On 8 Dec. 1672 Joliet reached Saint Ignace under his own authorization from De Frontenac and one from Father Marquette's provincial, to claim for God and the king all the land and water they could find.

When the ice broke, on 17 May 1673, Marquette and Joilet set forth. Father Pierson took Father Marquette's place at the mission. Father Marquette was something of a surveyor, and his maps are yet in evidence and very valuable. Two birch canoes that could only hug the shore and not dare the open lakes, and seven men,— five *voyageurs* — made up the expedition. Their stores were barely sufficient, their scientific instruments were, as one can easily imagine, inadequate. They were hopeful, hardy and they knew every mood of the treacherous lakes and the meanings of all the changes in the weather. Marquette had acquired the quick eye and ear of the Indian, and his mind was supple and well-trained; Joilet was not far behind him in wood and water craft. Still, they followed dim rumors. The most interesting of Marquette's reports is that of the second halt at the Indian village of Mascouten, on Lake Winnebago. They had reached the "jumping off" place. Their first halt was at De Pere, the Mission Saint Francis Xavier, to which Father Marquette had been recently assigned. They reached Lake Winnebago by way of the Fox River. From Green Bay,— the Mission Saint Francis,— they went to Lake Winnebago, and, from thence, accompanied by the Indian guides, they ascended the upper Fox River and entered the Wisconsin, on 10 June 1673. After seven days of hard paddling, they entered the Mississippi on 17 June. The report of this expedition on which we must rely for information is Marquette's,— Joliet's having been lost in the upsetting of his canoe at the La Chine Rapids, near Montreal. It is included in the 'Jesuit Relations,' and quoted by John Gilmary Shea, Sparks, Parkman, Thwaites, Hedges, and all who have written of the early days of the Northwest. Dr. Shea, in his 'Discovery and Exploration of the Mississippi Valley,' estimates the distance traveled by Marquette and Joliet from Saint Ignace to Green Bay (Mission Saint Francis Xavier), at 218 miles. General Wood, inspector-general United States army, makes the whole distance traveled 2,549 miles, but he omits the distance from Saint Ignace to Green Bay. Marquette and Joliet explored the Mississippi for 300 miles in solitude. Marquette describes the river at its junction with the Missouri as turbulent in the extreme. Marquette was pleased by the treatment received at the first village of Illinois Indians. They met Indians who showed some traces of civilization, and at the mouth of the Arkansas, they met with great kindness from the Indians. From the Illinois — believing the route to be shorter — they went, it is asserted, to a point near Chicago. By portage, at Sturgeon Bay, they saved time and strength, and from the Green Bay into the Fox River, they reached the Mission Saint Francis — having spent, from the beginning of their ascent of the newly-discovered river, on 17 July, about two months — four months, in all, of almost incessant hardship since they began their voyage on 17 May 1673. Further journeying was out of the question. Marquette and Joliet had not much strength left. A journey of nearly 3,000 miles, in birch canoes, had told on them, hardy as they were. Marquette spent 13 months at De Pere, endeavoring to regain his health. He knew well the stupendous importance of what he had done for France and for the world; but his business was with souls. While Joliet went to Montreal to report, Marquette started to found a new mission in Illinois. He left the Mission Saint Francis on 25 Oct. 1674, with 10 canoes; he arrived at the Chicago River, 4 December. The description of the carrying of the canoes through the forests gives a glimpse of the difficulties the missionary expected to encounter. The inundations of 30 March 1675 destroyed their hovel. At Kaskasian Marquette's heart was filled with gratitude by the kindness he received. His desire for exploration led him, while using his strength in ministering to the Indians, to explore Lake Michigan farther. He grew weaker, and turned to the north. Through the river — now Pere Marquette — he made his homeward way. On Saturday, 18 May 1675, he died. The Ottawa — under that name were included the tribes under the Jesuits in the Lake regions — had among them several Hiskakons, to whom Marquette had been much devoted. These, going northward in the spring, raised his body, reverently prepared it according to the mode of their tribe, took it to the Mission Saint Ignace, where Fathers Nource and Pierson awaited it. On Tuesday, 9 June 1676, Marquette was buried in the centre of the chapel of Saint Ignace, a building which was destroyed by fire in 1706. In September 1877, Father Edward Jacker, pastor of Saint Ignace, discovered the grave and remains of the great and good explorer, and they rest under a monument erected by the citizens of Saint Ignace in 1882. Consult

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MARQUETTE, märˈ-kĕtˈ, Mich., city, county-seat of Marquette County, on Lake Superior, and on the Duluth, South Shore and Atlantic and the Lake Superior and Ishpeming railroads, 13 miles northeast of Ishpeming, and about 58 miles north by west of Escanaba, on Lake Michigan. The first permanent settlement was made about 1845 and a little later it was called Worcester after public accounts had been given of the mineral wealth of the Upper Peninsula. It was incorporated in 1851 and chartered as a city in 1869. It was named after Père Marquette (q.v.) who had visited this section as a missionary to the Indians. It has a fine harbor with a breakwater 3,000 feet in length, and the best of facilities for loading steamers with the minerals, especially iron ore, which are shipped from here in large quantities. The ore docks are the largest and best fitted of any in the country. It has steamer communication with all the important lake ports. Near the city are large quarries of brownstone which furnish employment to a number of people. The chief industrial establishments are a planing-mill, two blast furnaces, steam-engine works, and the stone quarries, all employing about 800 men. Other smaller industries are the manufacturing of furniture, sash, door and blinds, and bricks. The principal buildings are a government building which cost $150,000; a county courthouse, cost $250,000; Peter White Library, the building cost $75,000, and the 15,000 volumes are valued at $30,000; a city hall, cost $60,000. The educational buildings are a State Normal School, which cost $150,000, eight public schools, cost $500,000, a manual training school and Saint Joseph's Academy. It has Protestant Episcopal and Roman Catholic cathedrals, Saint Mary's Hospital, the Upper Peninsula State Prison and a house of correction. The Federal government presented to the city Presque Isle, about 400 acres, a short distance north of the city proper. The place has been improved and made into a beautiful park. A statue of Père Marquette is in a city square, near the shore. It is a port of entry, a vast amount of iron ore passing through. The three banks have a combined capital of $400,000, and the annual business amounts to $7,500,000. The government since 1913 has been of the commission type. The electric-light plant and waterworks are owned and operated by the city. Pop. 12,117.

MARQUETTE RANGE. See IRON ORES — *Iron Ore Districts.*

MARQUETTE UNIVERSITY, Milwaukee, Wis., comprises the following departments: college of arts and sciences; college of applied science and engineering, school of dentistry; the R. A. Johnston College of Economics; school of journalism; school of law; school of medicine; conservatory of music; school of pharmacy; training school for nurses; and Marquette Academy, the university high school. The faculty numbers 240; the average annual attendance of students is over 1,500; tuition fees range from $60 to $170; living expenses from $128 to $190. The different courses lead to the degrees of bachelor of arts, bachelor of science, doctor of medicine, bachelor of laws, doctor of dental surgery, bachelor of commercial science, bachelor of journalism, bachelor of literature, pharmaceutical chemist and bachelor of science in pharmacy. The grounds of the university consists of five tracts on which are the buildings housing the various departments. Owing to the great increase in enrolment of students the erection of several new buildings is projected. In March 1916 a building and endowment campaign carried on in Milwaukee and in the State of Wisconsin resulted in a $503,471 fund. The college library contains nearly 13,000 volumes and there are supplemental libraries connected with the departments of law, medicine, dentistry, engineering and economics, while students have access to the neighboring city public library which contains over 340,000 volumes and to the city museum, one of the largest and most complete in the United States, containing hundreds of thousands of zoological, botanical, mineralogical and other specimens. The history of Marquette University begins with the arrival of Jesuit fathers in 1855 who two years later opened Saint Aloysius Academy. In 1864 a new building known as Saint Gall's Academy was erected and incorporated as Marquette College. In 1906 it celebrated its silver jubilee with the erection of a new building and a new charter creating Marquette University. Its progress has been one of continuous growth due to administrative economy, encouraging although inadequate laic support and tutorial service without salary, the Jesuit professors of the faculty giving their time, training and ability to the city with no material recompense beyond personal support.

MARQUEZ, José Arnaldo, hō'sā' arnal'do mär-kāth, Peruvian poet: b. Peru, about 1825; d. Lima, 15 Jan. 1881. For participation in civil wars he was several times banished in the earlier part of his career and he lived variously in Chile, Cuba and the United States. Among modern Peruvian poets Marquez takes high rank. He published 'Lost Notes' (1862); 'Flor de Abel,' etc., and in prose 'El Peru y la Espana moderna,' and 'Recuerdos de un viage à los Estados Unidos de America.' He lost his life in the defense of Lima against the Chileans.

MARQUEZ, Leonardo, Mexican soldier: b. Mexico, about 1820. In 1849 he appeared as the leader of a movement in support of Santa Anna, and under Santa Anna's last administration he had important posts in the army (1853–55). He fought against Juarez in the «Reform» War, and favored the establishment of Maximilian's empire. In October 1866 Maximilian made him a division commander, and in March 1867 sent him to Mexico City to form a cabinet and raise troops for the relief of Querétaro. But he was hemmed in by Diaz, and after Maximilian's execution resigned and went to Havana. He was frequently called «the tiger of Tacubaya,» from his execution there of a large number of prisoners (11 April 1859); though he alleged the express order of Miramon as an explanation. He was exempted from the amnesty of 1870.

MARQUEZAS ISLANDS. See FRENCH ESTABLISHMENTS IN OCEANIA.

MARQUIS, mär'kwis, or **MARQUESS** (Italian, *marchese;* French, *marquis;* German, *markgraf*), a title of honor next in dignity to that of duke. Marquises were not known in England till King Richard II, in the year 1385, created his great favorite, Robert Vere, the Earl of Oxford, Marquis of Dublin. In 1397 the same king raised John de Beaufort, Earl of Somerset, to the rank of marquis, a dignity which he afterward refused to bear from its being an innovation. The title fell into disuse until the reign of Edward VI, who created the marquisate of Winchester in 1551. The title given a marquis in the style of the heralds is *most noble and potent prince.*

MARQUIS, Thomas Guthrie, Canadian author: b. Chatham, New Brunswick, 1864. He received his education at Queen's University, Kingston; was made English master at the Stratford High School and subsequently at the Kingston Collegiate Institute. Later he became principal of the Collegiate Institute at Brockville. After 1901 he devoted his entire time to literature. In 1905 he was chief editorial writer on the Ottawa *Free Press.* Subsequently he edited 'Canada and its Provinces' (22 vols., 1914–15). He also published 'Stories of New France' (1890); 'Stories from Canadian History' (1893); 'Marguerite de Roberval: A Romance of the Days of Jacques Cartier' (1899); 'Canada's Sons on Kopje and Veldt' (1900); 'Life of Lord Roberts' (1901); 'President of the United States' (1903); 'Brock: The Hero of Upper Canada' (1912); 'The War-Chief of the Ottawas' (1914); 'The Jesuits Missions' (1915). He edited the Canadian biographical collection entitled, 'The Builders of Canada' (1903).

MARRAKESH. See MOROCCO.

MARRELLA, a genus of fossil Crustacea found in the Cambrian shales of British Columbia. See STEPHEN FORMATION.

MARRIAGE, History of (Latin, *marito,* from *maritus,* husband, from *mas,* a male). In the natural history sense marriage may be defined as a more or less durable union between male and female lasting till after the birth and rearing of offspring. In the ethical and legal sense marriage is a union between man and woman living in complete community of life for the establishment of a family. See article on the FAMILY, HISTORY OF.

The Origin and Social Function of Marriage.— In the natural history sense of the word marriage may be said to exist among many of the animals below man. Pair marriage is common among the birds and some of the higher mammals. It especially characterizes the anthropoid apes, the pair marriage of the chimpanzee being monogamous and durable, probably not unlike that of primitive man. The origin of marriage is therefore to be sought in the family, rather than the origin of the family in marriage. See article on family above referred to.

The function of marriage in human society is twofold: (1) to regulate the relations between the sexes and (2) to determine the relation of the child to the community. This latter function is often overlooked, but is quite as important in any scientific consideration of marriage as the former.

Practically all forms of marriage may be found among human beings if we consider all peoples and all historical ages, although the primitive or original form of marriage seems to have been that of a simple, pairing monogamy, similar to the pair marriage which is common among the higher animals. The reasons for rejecting the hypothesis of a primitive state of promiscuity have already been given in the article on the family just cited. Whether such a form as communal or group marriage (limited promiscuity) has ever existed among any people has been much debated by anthropologists and sociologists. The nearest approach to this form of marriage is found in certain aboriginal Australian tribes, where a man who takes a wife from a certain group has sexual access to all the other women of that group, though he lives with only one of them. A similar form is to be seen in the Punaluan family of the Polynesians, the marriage of a group of brothers with a group of sisters, though this form was rare even among the Polynesians. Most anthropologists and sociologists believe that such forms of group marriage were not primitive, but were relatively late historical developments. Setting these aside as exceptional forms, the main types of marriage in the human species may be grouped under the heads of polygyny, polyandry and monogamy.

Polygyny (Greek, "many wives").—A common form of marriage in barbarism and lower civilization is the union of one man with several women, scientifically known as polygyny, but popularly called polygamy. It is possible that this form of marriage existed to some extent in primitive times, as the gorilla among anthropoid apes is said to practise it. In general, however, it presupposes a considerable accumulation of wealth and is therefore among strictly savage peoples very rarely practised. As a human institution it received its chief development in the period of barbarism, and seems to have been an accompaniment of the development of dominantly militant life and of slavery in that period of human culture. Among people who practise polygyny, therefore, the practice is largely confined to the wealthy and ruling classes, as only these can afford the luxury of having more than one wife. In polygynous countries of the present rarely over 5 per cent of the families are of polygynous type. Owing to the fact that the number of males and females in any given population under normal conditions is relatively equal even in polygynous lands, the mass of the families are necessarily monogamic.

The causes of polygyny are complex. Beside the animal instincts of the male we must place especially the military honor of wife capture and the economic value of women (or wives) as laborers. In barbarism the outward and visible sign of a man's wealth and power is frequently the number of his wives. A contributory cause among some peoples is the high valuation set upon children, especially under the patriarchal system (q.v.). This seems to have been the main cause in the case of the Hebrew patriarchs.

The practice of polygyny has been widespread among practically all peoples from the

stage of barbarism up, though limited to the prosperous and well-to-do. Where it failed of legal sanction it frequently existed in the more or less illegal form of concubinage. It is not surprising, on this account, that in many cases it has received the explicit sanction of religion as in the cases of Mohammedanism and Mormonism. But among all peoples it has tended to die out with the coming of higher civilization, for the reason that it obviously involves the subjection and degradation of woman, the lack of paternal care of the children and the placing of a premium upon the more brutal instincts of human nature, especially in the male.

Polyandry (Greek, "many husbands").—The union of one woman with several men is a rare form of marriage found at present practically only in Tibet and among some of the mountain tribes of India, though within historic times it existed in Arabia. Apparently polyandry has never been a wide-spread form of marriage in the human species, as the instinctive jealousy of the male works against it; and there is no reason for supposing, as McLennan supposed, that primitively it was universal. On the contrary, it seems to exist only under such economic and social conditions as might lead to the suppression of male jealousy. Thus the difficulty of one man supporting a family has in the barren regions of Tibet led to the toleration of polyandry. In the same region there seems to be a scarcity of women, which also favors the practice of polyandry.

The most common form of polyandry is the fraternal or Tibetan form, in which a group of brothers have a common wife, the oldest brother being the head of the household and the putative father of all the children. Among the Nairs of India, however, a non-fraternal form of polyandry exists.

Monogamy (Greek, "single marriage").—Polygyny and polyandry, as we have seen, have always been exceptional forms of marriage. The prevalent form of marriage among all peoples and in all ages has been some form of monogamy, the union of one man and one woman. This has been so largely by biological necessity, as under normal conditions the number of males and females in any given population is relatively equal. The instincts of man have also to some extent favored monogamy, especially the instinct of sex jealousy. Economic conditions also have rarely made it possible for a man to support more than one wife and her children. Besides such biological and economic reasons for the existence of monogamy, however, it has manifest social superiorities to any other form of marriage. It is much more favorable to superior care and upbringing of children, as under monogamy both husband and wife commonly unite in the care of the child. It develops affections and emotions of a more altruistic type, and it makes the bonds of the family life more definite and strong. For these reasons monogamy favors the development of higher types of morality and of civilization generally. Its association with higher types of civilization is, therefore, not an accident. At its best, the monogamic family presents such superior unity and harmony that it is best fitted of all the forms of marriage to work in harmony with higher civilization.

The Marriage Ceremony.—Among all peoples, savage as well as civilized, legal marriage is usually accompanied by some form of ceremony which expresses the sanction of the group upon the union. This ceremony is usually of a magical or religious character, though in a few peoples it is apparently purely social. Betrothal is also, among the more advanced peoples, frequently an occasion for some sort of religious or social ceremony.

The Freedom of Choice in Marriage.—Westermarck presents considerable evidence to show that among primitive peoples marriage was originally based on the mutual attraction and consent of the parties. Almost always the male is the wooer. The female accepts or rejects her lover, and thus plays the decisive rôle in sex selection. The same phenomena of courtship also appear very generally among the animals. There is no reason for supposing that different conditions existed among primitive men. The common practices of wife capture and wife purchase must be regarded as exceptional conditions developed in later stages of civilization. Marriage thus began in free choice, but among many peoples passed through stages of wife capture, and of wife purchase, under the dominance of family or tribal interests, becoming only gradually in modern times again a matter of free individual choice.

Marriage by Capture and by Purchase.—Among predatory and warlike tribes marriage by capture is often common; indeed, on account of the social and military honor attached to wife capture, it sometimes comes to be the favorite form of marriage. We know of no people, however, among whom wives are regularly captured outside the tribe. Manifestly such a social state would be practically impossible, even though wife capture was socially favored.

Much more common than wife capture, but at a much later stage of cultural development, was wife purchase. This stage comes in particularly in early barbarism with the development of slavery and the idea of property in persons; and among most peoples it has survived until higher civilization has been developed. It was particularly instrumental in developing polygyny and the patriarchal form of the family. Many survivals of wife purchase exist among even relatively highly civilized peoples.

Child Marriage.—Another result of wife capture and wife purchase among some peoples was the practice which we know as "child marriage," that is, the uniting in formal marriage of children under 15 years of age, usually the marriage of a girl under 15 with a much older man. As a custom, child marriage is not unknown among warlike savage and barbarous tribes. It developed, especially in India, however, under the influence of the caste system and the custom of wife purchase. More than one-half of the total female population of British India are married before 15 years of age, sometimes while they are mere infants. In the western provinces of India the girl remains at home with her parents until sexual maturity is reached; but in Bengal, girls commence their married life at the age of nine years. The British government has made ineffectual attempts to check child marriage, but the practice continues, as it is supported by the higher as well as by the lower Hindu castes.

Exogamy and Endogamy.—Among practically all peoples, custom forbids the marriage of very near kin. A limited number of tribes among savage and barbarous peoples do not forbid the marriage of brothers and sisters, but all view with social disapproval sexual relations between parents and children. Indeed, the larger number of uncivilized peoples not only condemn sexual relations between blood relatives, but forbid marriages between members of the same clan, or totem group. As clans may be metronymic or patronymic, this restriction prevents marriage between maternal or paternal relatives as the case may be, even to the most remote degrees of kinship, but makes it possible for a man to marry a near relative in a clan to which he does not belong, on the ground that no kinship tie exists between them. This custom forbidding marriage within the clan is known as "exogamy." It is nearly always correlated with "endogamy," as respects the tribe.* Thus in the clan or totemic stage of social organization, in which most of the North American Indians were at the time of their discovery, a man must take a wife outside of his clan or totem-kin group, but usually must marry within his tribe or related tribes.

The causes of such customs of exogamy and endogamy have been much debated. McLennan held that exogamy was the outgrowth of the custom of female infanticide, but there is little or no evidence in support of such a theory. Westermarck's explanation is that exogamy arises from the extension to the whole clan of the natural instinct of aversion to incest. It may be pointed out, however, that exogamy and endogamy are not customs peculiar to uncivilized peoples. Similar rules are found regarding forbidden degrees of relationship among civilized peoples. While there is possibly a natural aversion to incest, there is even more pronouncedly instinctive attraction between persons of the opposite sex who are relatively strange and unfamiliar. This leads naturally among all peoples to marrying outside of the close social group; and among the uncivilized all members of a clan are regarded practically the same as very near relatives. The main difference in the practice of exogamy among the uncivilized and among the civilized is that in the clan stage of social organization it is not blood relationship in our sense which counts, but the type of social organization itself.

Marriage Among the European Peoples. — Among the early Aryan peoples of Europe marriage was universally regarded, so far as we can discover, as a religious bond, since their family life was based upon ancestor worship. This early Aryan view of marriage gave way in later Rome to the view that marriage was a private contract, to be made and dissolved by the parties at their pleasure. The early Christian Church combatted this view of the marriage relation and sought to restore the view that marriage was a religious bond, which it finally did by making marriage one of the sacraments of the Church. It was forced, however, to still recognize that consent or contract was the essential means of entering the marriage relation. "Consent marriages" continued to be recognized, therefore, though they could not be broken except through the authority of the Church. The Protestant reformers put forth the idea that marriage was a civil relation, rather than a religious bond or sacrament, to be created by the state and broken by the state. In reaction to this view the Roman Catholic Council of Trent in 1563 declared that a valid marriage could only be created by the Church and only annulled by the Church. This still remains the Roman Catholic view of marriage. The later Roman view that marriage is a private contract, to be created and broken by individuals as any other contract, has shown a tendency to revive in modern nations among many elements of their population. The present problem of the family, therefore, centres about the question of divorce and the toleration of other forms of marriage than that of permanent monogamy. (See article on FAMILY, HISTORY OF). The last three theories mentioned are evidently held alongside of one another by different elements in the populations of modern nations. Which of these competing theories of marriage will become established in the moral standards of the future it is too early yet to say.

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MARRIAGE, The Law of. When the cave man wanted a mate he took her, and he was not very particular where he got her. His next neighbor's cave, indeed, would be the most convenient and likely place. It was a mere question of brute strength; the man of greater physical power had his way. As social evolution progressed and families were established and organized into clans, the man who preferred to gain a wife by capture had to go further afield. To have forcibly taken a woman of an allied family, or from an affiliated clan, would have brought down upon the offender the vengeance of an entire community and, against this, individual force could not prevail. Wife capture had to be practised against hostile tribes, from whose vengeance the robber would be protected by the whole of his own community. The Roman legend of the rape of the Sabine women points to a time when wife capture from unrelated and, therefore, enemy communities was a common practice. Probably robber-marriages persisted, to some extent, even in the home circle, so to speak. Among a number of semi-barbarous nations marriages still take the outward form of abductions. Before the leveling influences of Russian civilization had almost completely obliterated their tribal customs, wife captures were regularly staged by the Kirghis of the steppes. The bride, mounted on a swift horse and carrying her dowry, rode furiously out of her father's camp and the bridegroom gave chase. He was expected to catch her before dark, and he always did — that was part of the comedy. The whole performance was *camouflage* for the pur-

*The tribe being a group of related clans speaking the same language.

pose of covering up the real transaction, which was nothing else than a bargain and sale. Marriage by purchase was evolved, almost inevitably, from marriage by capture; the prospective husband paid a price to the family of the prospective wife for the privilege of carrying her off. Sometimes the abduction preceded the payment of the purchase price, the latter being disguised as a fine subsequently amerced to atone the "offense." In some instances, as under the early Roman law, the woman was adopted; she came under the fatherly power of the husband and, theoretically, became his daughter. In other times and places marriage was frankly a sale. In all cases the wife became the property of her husband and, at the worst, she was his drudge or slave. The tutelage, which was exercised over a woman throughout her life (even after her marriage) by the males of the family in which she was born, was intended to be protective of her honor and that of her family, as well as of her share of the patrimony of family property. An instance in point is the Levitical law, which permitted the father of a bride, put aside by her husband on charge of unchastity, to proceed against the accuser, and, the accusation being disproved, compelled the offender to expiate the wrong by keeping the woman as his wife all the days of his life. The actual condition of the wife was not as hard as might be implied from her legal status, or lack of legal status. The injunction to obey the father is coupled with the injunction to honor the mother. In the great Oriental monarchies of antiquity marriages were undisguisedly commercial transactions; the bought wife of a citizen of Babylon, however, was the manager of her husband's house and she was habitually consulted in serious matters of business. She was conferred with even in affairs of state if her husband happened to be a public official. A free woman, though married, might occupy a public position and hold separate property. Primitive communities do not clearly distinguish between custom and law or religion and morals; but in course of time a strictly religious form of marriage might be substituted for contractual marriage in any given community. The contractual or purchase marriage itself has a tendency to become symbolical and dramatic. The pledge given by the wooer to bind the bargain might originally have been a cow (domestic animals were real money, cattle or chattels and *pecunias* were words of identical meaning). This was later on represented by a gift to the bride — a bracelet, jewel or other token. The "giving in marriage," i.e., the consummation of the sale of the woman, would be accompanied by conventional words and gestures, dancing and music. Sometimes a wooer made payment in personal services, as Jacob tended father Laban's sheep seven years for Rachel; and in this, as in other cases without number, the marriage was a matter of mutual inclination. The bride usually received from her father a dowry or *dos*, which passed to the husband and remained under his control during the continuance of the conjugal relation. Among the Jews and Oriental nations in general marriages were terminable by divorce at the will of the husband. Among the Romans they were terminable at the will of the wife's father or by mutual consent of the parties. In either case the bride's dowry was returned. The remarriage of widows was not forbidden, but was disfavored. Under the Babylonian law the consent of the courts had to be obtained and provision made for the care of the children and household of the deceased husband. Monogamy and polygamy often existed side by side, even in highly developed human societies. Of the two great cultural races, the Semites have given distinct legal sanction to plurality of wives. Polygamy was practised by the Hebrews in the patriarchial stage, though the practice fell into abeyance in later times. Aryan institutions seem to be based on monogamous marriages. For obvious reasons monogamy must be the usual state in all communities, whatever may be the law. Relatively few members of a community have the power to gain or the ability to maintain more than one wife. While a man individually might capture a woman of a hostile tribe and make her his lawful wife, captives of war became slaves. Among Oriental nations the children born to free men of their slave women or "hand maidens" were considered legitimate and free. Among the theoretically monogamous Aryans the opposite was the prevalent rule.

The marriage by appropriation and the resulting guardianship — or, more plainly speaking, ownership — of the wife by the husband, does not comport with the sociological thesis that the institution of the patriarchate was preceded by the matriarchate as a form of family organization. The practice of polyandry is rare, even among savages, and where it is observed among people of culturally higher stage it indicates degeneracy more probably than primitiveness. In Tibet polyandry is evidently an outgrowth of the group marriage — the marriage of all the daughters of one family as a group with all the sons of another family. The plural husbands of polyandrous Tibetan women are invariably brothers. A rather frequent form of primitive marriage is that where the husband is adopted into the tribe of the wife. That in such case the patriarchal authority would be less pronounced than otherwise is not evident, however. The male adopted into a tribe would assume the tribal name and be on the same footing with the males born therein. Within a clan blood kinship is traced through females; but it is not necessary to presume the matriarchate as an antecedent social order to account for this. The maternity of a child is determinable with so much greater certitude than its paternity that the tracing of kinship through the mother would commend itself for its convenience. Moreover, in those clans where this method of reckoning is customary the family and tribal organization is invariably patriarchal. Practically without exception the nations which have become the leaders in culture have erected their social structure on a basis of monandrous marriages and agnatic kinship. The wife is taken into the husband's *gens*, clan or house, and her children become members thereof and are given the family name of their father. In the matter of inheritances cognizance was usually taken only of relationship in the male line. A daughter might inherit from her father, but if she died before he did her children would take nothing by

representation; hence the importance of the *dos* or marriage settlement. By neither the Roman nor Teutonic rule of consanguinity was a man's sister's husband of kin to him and the suggestion of a prohibited degree of relationship between himself and a deceased wife's sister would have sounded queer to Cæsar or Cicero. The Levitical law took more account of blood relationship through females and made even a man's stepmother his cognate in blood. Stepbrothers and stepsisters could not intermarry, though they had no parent in common. It also forbade marital communion between certain other persons whose affinity was merely legal — as between a man and his uncle's widow or with his daughter-in-law. It forbade marriages of near relations to the third degree of blood kinship on either the maternal or paternal side — and this rule has prevailed throughout the Christian world. According to the Levitical law a man should not bring his sister-in-law into his house as a rival to his wife, but there was no prohibition with a deceased wife's sister and a man was expected to be a husband to the childless widow of his brother.

In the earlier period of their history the Romans recognized three kinds of formal marriage. The religious form, *confarreatio,* or "marriage with the bread-offering," had to be solemnized by the Pontifex Maximus in the presence of 10 witnesses and was reserved to themselves by the old patrician families. Among the plebians espousals took the form of a purchase, *coemptio,* which is defined by Gaius as a mutual mock sale of the parties, whereby the wife was freed from *tutela legitima* and *sacris familiæ* — tutelage to her male relatives and contributions for the maintenance of certain religious rites in her husband's household. The third form, *usus,* though held in little respect in the earlier period, ultimately became prevalent in all social ranks. Either by confarreation or coemption the woman given in marriage passed *in manum viri,* literally into the hands of the man, her husband, who acquired rights over the person and property of his wife greater, on the whole, than have been, or are, conferred by any modern system of law. He controlled her *dos* and other possessions absolutely during his life and continued his wardship after his death through guardians appointed in his will. The *usus* ripened into a perfect matrimonial bond only by prescription and after continued cohabitation for an entire year. In the meanwhile the husband's marital despotism was in abeyance. By simply absenting herself from the matrimonial domicile for one day in each year the *usus* wife could indefinitely postpone and defeat the acquirement of tutelary and possessory rights by the husband. On the other hand, the later law reduced the tutelage of the male kin over the women of their family to a mere formality. By contracting a usus marriage, therefore, the women of Rome were enabled to evade both the paternal and matrimonial tyranny, under which they had been placed by the earlier law. In fact, at the most splendid period of Roman greatness married women enjoyed a freedom with respect to their persons and property such as they have not enjoyed anywhere since then. Most important of all was the establishment of the principle that marriage rested upon the consent of the parties — *concensus, non concubitas, fecit nuptias* — and might, therefore, be dissolved at the pleasure of either party. While the marital union was admitted to involve a sharing of all for life — *consortium omnis vitæ* — this was declared to mean a voluntary, not a forced, partnership. To hinder a separation when a consensus had ceased to exist was regarded *contra bonos mores,* in plain English, "immoral."

Early Teutonic marriage law did not differ greatly in fundamentals from that of Rome. Though disguised by ceremonials the transaction was essentially a barter. In the original and crudest form the custom was to give the father so much for his daughter, the price being fixed in accordance with the wealth and rank of the families participating in the treaty. The contract was made handfast, just like any other bargain, by a pledge or part payment. In progress of time this pledge, *vadium,* took the form of an ornament of more or less value presented to the bride at the betrothal — in modern practice an engagement ring. In time also the *arrha* (purchase money) became a gift to the bride instead of a payment to her father, though the latter retained it in trust for his daughter. The payment of the marriage settlement — and this the *arrha* was in effect — might be postponed during the lifetime of the husband, on his giving security for the transfer of an equivalent out of his estate to his widow. The purchase price for the bride thus became dower in form as it had always been in essence and in intent. Some early Teutonic laws distinctly sanctioned the "robber-marriage," which was nothing more than an abduction, or, the bride being willing, was simply an elopment. The penalty the abductor was required to pay to the outraged father was usually identical in amount with the prescribed amount of the settlement or dower in the more orderly form of wedding — indicating that barter marriage and robber marriage stood on about an equal footing of respectability. The Teutonic maiden when given in marriage was usually provided with an outfit for housekeeping and a dowry. Possibly an abducted bride would receive neither, which may be the reason why abductions were sometimes accomplished by connivance of the bride's family. In modern days elopments are often similarly motivated. There is nothing new under the sun, even in marriages. Betrothals in a regularly arranged ancient Teutonic marriage were attended by festivities on a scale comparable with those attending the wedding itself. Indeed, some investigators of primitive law insist that the troth-plighting was not a mere promise to marry but was, in verity, the contract of marriage. The giving of a pledge (*vadium*) to bind the bargain would indicate to a person exercising ordinary common sense that the betrothal was no more than an executory contract. It created an obligation to wed but did not actually establish a marital relation. The disputations on the subject have the appearance of mere quibblings with words. To be sure, if one buys a thing to be delivered to-morrow and pays part of the price, a sale has doubtless taken place. Of course, a delivery is necessary to complete the transaction; and, if the thing purchased be a cow, it might be said that she is not under complete dominion

of the new owner until he has put her into his stable and locked the door. Possibly some such mental kinks is responsible for the suggestion of other investigators of ancient Teutonic customs that *concubitus* was a legal essential to the consummation of a marriage. Be that as it may, the idea of a threefold stage in the process of acquiring a wife — the troth-plighting, the wedding and the consummation — has persisted in legal phraseology and has colored even very modern legal conceptions. Early Teutonic law permitted a husband to put aside his wife for adultery or barrenness, and it seems to have countenanced dissolution of the matrimonial bond by mutual consent.

From the very outset Christianity set its face against the looseness of the later Roman law respecting marriage. The legislation of the Christian emperors shows a reaction against the extremely liberal doctrines of the Antonine jurisconsults. The prevalent state of public opinion explains why, in the fusion of patriarchal practices, Roman jurisprudence and barbaric usages, so many retrogressive customs of the latter respecting the position of women should have found their way into the new alloy. The principles of the Roman law prevailed in so far that unmarried women were relieved of bondage to the family after attaining their majority. But the position of married women became fixed in barbaric archaisms and the husband drew to himself all the powers that had belonged to the wife's male kindred. The Church declared marriage to be a sacrament and the consequence was the enunciation of the doctrine of the indissolubility of the matrimonial union except by death. Through the decretals, through its influence on the customary law in the matter of dower and through the assumption of jurisdiction by the ecclesiastical courts over matrimonial questions, the Church established a universal marriage law throughout the Christian world. The canonists accepted the principle of the Roman law that the consent of the parties is essential to the making of a legal contract of marriage, just as it is to the making of any other contract. The lack of free consent, because of a material error in fact or because of physical or moral duress, or because of natural or legal incapacity of one or both of the parties (impotency, insanity or minority) were declared insuperable impediments to the execution of the contract, and grounds for its annulment if executed. From the Roman law also the canonists carried over into their system the age of consent — 14 for males and 12 for females — but they rejected the requirement of parental consent. In seeming contradiction to this, the father still "gives away" the bride in the marriage service. The Roman idea, that betrothal (*sponsalia*) was merely a promise to marry, was modified under the influence of Teutonic usage, by which the troth-plight was considered to have created the relation of husband and wife. Ultimately the canonical law made a distinction between *sponsalia de futuro* and *sponsalia de præsenti*. The former was declared a mere promise; but a present agreement (*accipio*) was held to constitute a valid marriage. Such a marriage if not consummated was dissoluble, however, either by a vow of celibacy taken by one of the parties, or by special dispensation. The troth-plighting in the marriage service and the wedding of the bride with a ring may be reminiscences of the Teutonic hand-fasting and the payment of the *vadium* or pledge, while the marriage settlement looks very much like a modern variation of the transfer to the bride of the *arrha*. Formidable impediments to marriages within the family, even between very distant relations, were created by the canons of consanguinity and affinity. The degrees of kinship were measured from the common male or female ancestor downward in collateral lines of descent. Each successive generation being but one degree further removed from the source of the blood, persons might stand in close relation to each other, though wide apart collaterally. Second cousins, for instance, were akin in the third degree by the canon, though the Levitical and Roman law would both place them in the seventh degree. The earlier Church canon forbade intermarriage down to the seventh degree, so that sixth cousins could not enter into matrimonial relations with one another. In the later Church law the prohibition ended with the third degree canonical, or with second cousins. Relations by affinity or marriage were laid under similar disabilities as blood relations. Sisters-in-law and brothers-in-law were as incapable of contracting marriages as natural brothers and sisters; likewise the children of husbands and wives by former marriages. These prohibitions conform to a sense of delicacy and they accord with a not unreasonable interpretation of the Levitical canon. But a reason for tracing relationship of any person to an uncle by marriage and to his children by a former wife and these children's children is hard to discover. Nevertheless, these canonical restrictions were not without salutary effect. The practice of intermarriage between kindred, in order to keep property within the family, had become prevalent not only among the nobility but in all ranks. Near relationship in blood or by marriage might exist among the entire population of a small commune, and such cases were not exceptional under conditions of life that did not encourage travel or changes of habitation. By compelling men and women to seek mates outside their own little circle, the Church set a wholesome limit to inbreeding. The habitual shifting of population and the great freedom of locomotion in modern times have made the extreme restrictions of the canon law quite dispensable. The Reformation produced important changes in the law of marriage. The Council of Trent pronounced clandestine marriages of minors to be nullities and required the presence of two witnesses in all cases. The Protestant ecclesiastical law denied the indissolubility of the matrimonial bond and regarded all betrothals as, presumably, *sponsalia de præsenti*. The words, "I will," Luther remarked, did not, in the Teutonic language, express a future intention but a present purpose; unless qualified so as to introduce an element of uncertainty any promise to marry, followed by cohabitation, was to be considered a valid marriage. Indeed, cohabitation in conjugal relation was quite generally regarded presumptive evidence of a marriage *per verba de præsenti*, though the presumption was not conclusive. By acts of Parliament passed in the second half of the 18th and the first part of the 19th centuries,

church weddings were required in all cases and all marriages not thus celebrated were declared void. Informal marriages, however, were still good in Scotland; and this circumstance explains how Gretna Green became a Mecca for runaway lovers. The statute of George II also made the parent's or guardian's consent essential to a valid marriage; but this requirement was rescinded later on. A statute of Henry VIII had adopted the Levitical canon as the rule for reckoning degrees of consanguinity in England. This permitted marriages between first cousins and persons of more distant relationship in blood, and it abolished, or was intended to abolish, all disabilities growing out of affinity or relationship by marriage. The Church of England, however, continued to the last in opposition to marriage with a deceased wife's sister, and still insists upon the indissolubility of the matrimonial bond except by the death of one of the parties.

In the eye of the modern law marriage is primarily a civil relation. Most of the European codes and, with one or two exceptions, even those of Catholic countries, make a civil marriage and the registration thereof in the public records indispensable. A religious ceremony may follow at the option of the contractants, but is not legally essential. A relation established by the civil authority can, of course, be dissolved by the same authority. Adherence to the doctrine of the sacramental character of marriage has become a matter of conscience; the law will not force obedience to the same. The modern law has generally raised the age of consent and has made the consent of parents or guardians necessary to the validity of the marriages of minors. All marriages must be publicly contracted. In England the requisite publicity may be obtained either in accordance with the rites of the Established Church or other religious denomination, or in accord with the rules made by the public registrar or by statute. Betrothal almost everywhere is now considered merely a promise to marry, and actions to recover damages for a breach of the promise are permitted in only a few countries. The dissolution of marriages by consent of the parties is, generally speaking, disallowed, but almost everywhere divorces may be obtained by process of law — in Austria only between non-Catholics. The powers of married women to deal with property vary considerably. In some of the French provinces the pre-Revolutionary *coutumes* gave to married women, below the rank of nobility, nearly all the independence which Roman jurisprudence in its final stages had allowed them. These local customs together with parts of the Roman law became the basis of corresponding provisions of the Code Napoleon and through the latter and to some extent the Spanish law have affected the law of Louisiana and a few other States of the Union. Husband and wife by this law acquired no general interest in each other's property on marriage. The only property the wife brought into the matrimonial pot was her *dot*, or dowry, which is in the nature of a wedding gift from her family. While the husband did not become the owner of the *dot*, he had the use of the same during the continuance of the marriage. The husband could even sue the wife if she hindered him in the enjoyment of the usufruct thereof. Every species of property owned by the wife at the time of marriage or subsequent thereto could become the subject of a dotal gift. The most interesting disposition of property permitted to husbands and wives, however, was the creation of a *communio bonorum*. The principle of the *communio bonorum* is that husband and wife shall have no property apart from one another. All that either of them owned at the time of, or before, their marriage, and all that either or both together acquired while living in the marital relation, was included in the communal property. As in the case of a partnership in business, the community property could not be made answerable for the individual obligations of the parties to a *communio bonorum* until all joint obligations had been satisfied out of the same. The husband became the managing partner or curator, however; the wife is excluded from every case in which her acts cannot be referred to an express or implied authority of the husband. The latter incurs all debts or charges for the community. The community ceases on termination of the marriage relation either by agreement, divorce or death; in the latter event the rights of the survivor are fixed by law. The *communio bonorum* is a form of marital partnership recognized not only in Louisiana, but in Texas, Florida, Missouri, California and other States carved out of territory once in French or Spanish possession. The principle has been greatly modified under influence of the common law and the modern statutes respecting the separate property of married women. The *communio bonorum* exists by legal presumption only with respect to property acquired during marriage, or in the name of either husband and wife, including the produce of their reciprocal industry and labor. The presumption may be rebutted by proof that any property so acquired was intended to be acquired as separate estate. Separate property brought into the marriage by either party forms no part of the community, except by express agreement; nor does property acquired after marriage by gift or inheritance.

In the United States a marriage may be either religious, civil or quite informal. Civil marriage was authorized, or required, in all the New England colonies. Milton's tractate on divorce and his denunciation of ecclesiastical "meddling" with marriage had borne fruit in the Civil Marriage Ordinance of Cromwell, passed in 1653. By this ordinance obligatory celebration before a justice of the peace was instituted, and a system of lay notice, certification and record was established. The action of the Puritans and Independents in England found ready followers in America. The States-General of the United Netherlands in 1656 adopted the principle of an older law of the provinces of Holland and Friesland, which had established a permissive form of civil marriage soon after their independence of Spain was achieved, and this naturally passed over into the law administered in New Amsterdam. For years the celebration of a marriage before a clergyman, as such, was illegal. Religious marriages were sanctioned later on throughout New England, and long before the close of the colonial era the dual civil and religious system was established, which has since prevailed. The "common-law" marriage, still recognized in most of the States, is nothing more than the canonical

sponsalia de præsenti under another name. Any agreement to marry *per verba de præsenti*, which is followed by cohabitation as man and wife, constitutes a legal marriage. A presumption of marriage is raised when the parties have lived together in marital relations, have acknowledged themselves (or have been generally reputed) to be husband and wife. This presumption, of course, is not conclusive and may be rebutted. A relation, originally meretricious, will not be transformed into a marriage by a mere informal agreement. This also is in accord with the canonical law. In all the States formalities attending marriage are prescribed by statute. Licenses to marry must be obtained, and the publication of the issuing of a license gives some sort of publicity, as does the requirement of the presence of witnesses and the making of marriages matters of public record. The persons who may perform the ceremony, clergymen or civil officials, are designated. The clerk issuing the license must be satisfied, by affidavit or otherwise, that there are no legal impediments to the marriage, and, in cases of minors, the consent of parents or guardians is usually required. In most of the States, however, the statutory requirements have been held by the courts to be merely "directory" and not mandatory. Non-conformity may involve the non-conformers, and the officials and ministers concerned, in legal penalties; but the marriage is not invalidated. In Massachusetts, however, the courts have always insisted upon the observance of the statutory formalities, declaring such observance to be essential to the validity of a marriage. The Massachusetts rule has been followed in some States and in others the statutes are mandatory. For either of these reasons the "common-law" marriage may be deemed to have been abolished in California, Illinois, Kentucky, Massachusetts, Missouri, Maryland, North Carolina, Vermont and West Virginia. In New York (since 1901) non-ceremonial marriages must be evidenced by a written agreement, signed in the presence of two witnesses and acknowledged in the same manner as a conveyance. The effort to secure the adoption by the States of a uniform marriage law has, thus far, been unsuccessful, and the greatest diversity continues to exist. Moreover, the general rule, that a marriage which is legal in the place where it is established will be regarded as formally perfect everywhere, permits the parties to evade inconvenient requirements of the laws of the place of their domicile by going out of the State to make the contract. The age of consent varies in the States, ranging from 16 to 21 years for males and from 14 to 18 years for females. Where the statutes are silent the canonical prescription of a minimum of 12 years for females and 14 for males still holds good. Infant marriages are voidable at the option of parents or guardians, if contracted without their consent. When any of the essential ingredients of a contract are lacking the marriage agreement, like any other contract, is a nullity. Consent being an essential, when one party or both have insufficient mental capacity to give intelligent assent no valid marriage can result. A misunderstanding as to a vital fact will avoid the contract, but only if the mistake was of such a character that there could have been no real consent. Duress excludes volition, and there is no such thing in law as involuntary consent. Impossibility of performance avoids the contract. Impotence, meaning want of physical capacity, makes marriage a nullity; but sterility does not. The marriage of a person having a living and undivorced former spouse is a nullity. Null and void also are marriages between persons in the prohibited degrees of consanguinity. All States forbid marriages between blood relations in the direct line of descent or ascent and between brothers and sisters of the half blood as well as of the full blood. All States forbid marriage between uncles and nieces or nephews and aunts and in 20 States the prohibition extends to consanguines within the fourth degree, which bars marriage between first cousins. Affinity through marriage among collaterals is usually disregarded, but in the ascending or descending line, as between step-father and step-daughter or between father-in-law and daughter-in-law the prohibition is frequent. In 25 States whites and negroes are forbidden to intermarry, the laws often defining to a nicety the fractional part of African blood which vitiates the marriage. In five States the prohibition extends also to the marriage of whites with Chinese or other Mongolians, and in four States marriages between whites and Indians are forbidden. In recent years legislation on the subject of marriage has been affected greatly by eugenic considerations. In Connecticut and Minnesota epileptics and feeble-minded persons are not permitted to marry and similar statutes have been enacted in other States. Michigan prohibits the marriage of persons afflicted with venereal diseases and the eugenic marriage law of Wisconsin made a physical examination by, and a certificate of health from, a physician a prerequisite to the obtainance of a license to marry. A woman on marriage acquires the nationality of her husband.

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STEPHEN PFEIL.

MARRIAGE OF FIGARO, The ('Le Mariage de Figaro'), Beaumarchais' most popular play, possibly the wittiest and politically the most effective of all dramas, was ready for the stage in 1778, three years after the success of 'The Barber of Seville' (q.v.), to which it was a sequel. But even while in manuscript it

became the centre of intensely active and complicated political intrigue. Louis XVI rightly discerned in it danger to his throne, and it was not publicly presented till 1784, when it achieved a success till then unparalleled, being by strange irony most applauded by the aristocratic class whose ruin it portended. To Napoleon, after the event, it seemed "the Revolution already in action," and it certainly contributed greatly to hasten and provoke by its leveling tendencies the disintegration of the conventions and even the foundations of the old social régime, though this seems the result rather of Beaumarchais' delight in his own wit, of mere wantonness, than of a realization whither his work was tending or of any deliberate revolutionary purpose. Figaro in 'The Marriage' is still the light-hearted, versatile, philosophic scapegrace of 'The Barber'; Almaviva and Rosine are what that play would lead one to expect they would be after some matrimonial disillusion. Of the new characters Suzanne, on whom Almaviva has set his vagrant fancy and Figaro his heart, is genially conceived, and Chérubin, the page and disquietingly precocious gallant, was a really daring creation, provoking reprobation and inviting controversy. Figaro is successful in defending his beloved from the wiles of Almaviva, but it has been not unjustly said that if the object of comedy is to make vice ridiculous or odious or contemptible 'The Marriage' can hardly claim to attain it. Universal mockery, supremely vivacious, a wit whose brilliancy puts morality off its guard, mar ethically a drama whose sustained excellence in dialogue had been hardly attained even by Molière. The best edition of 'Le Mariage de Figaro' is in 'Théâtre de Beaumarchias,' edited by d'Heyli and Marescot (Vol. III). For the circumstances of its writing, prohibition, reception and contemporary criticism, consult Loménie, 'Beaumarchais and His Times' (Vols. III and IV), also 'Le Centenaire du Mariage de Figaro,' edited by A. Paër (Brussels 1884). The play furnished the text for 'Le Nozze di Figaro,' a popular opera by Mozart (1786).

BENJAMIN W. WELLS.

MARRIED WOMEN, Legal Status of. See HUSBAND AND WIFE.

MARRIED WOMEN, Right to Conduct Business. See HUSBAND AND WIFE.

MARROW, a substance of soft vascular tissue filling the cells and cavities of the bones of mammals. It contains fat and both red and white blood corpuscles and is a valuable constituent of soups. The bone contents of mammals show wide variation. The largest constituent is usually water, but some marrows, as of the long bones, are mostly a yellow oil. Traces of albumen, fibrin and salts are also found. Red bone-marrow is highly nutritious and is recommended for anæmia. (See BONE). The vegetable marrow is a species of squash (*Cucurbita ovifera*), of oval form, ribbed and greenish-yellow color.

MARRYAT, măr'ĭ-ăt, **Florence,** English novelist, daughter of Frederick Marryat (q.v.): b. Brighton, 9 July 1838; d. London, 27 Oct. 1899. She was successively Mrs. Church (1854–90) and Mrs. Francis Lean. Her many novels, although not at all remarkable, were popular, and were published in various versions throughout Europe. They include 'Nelly Brooke,' 'Fighting the Air,' 'Facing the Footlights' and more than 80 others, many being devoted largely to spiritualism. She published and edited her father's 'Life and Letters' (1872).

MARRYAT, Frederick, English naval officer and novelist: b. London, 10 July 1792; d. Langham, Norfolk, 9 Aug. 1848. In 1806 he entered the navy, served on the coast of North America in 1811 in the *Æolus,* and in 1823 was commander of the *Larne* during the first Burmese War, in 1825 had the naval command of a successful expedition up the Bassein River, and in the same year was made captain of the *Tees.* From 1828 until his resignation in 1830 he commanded the *Ariadne.* He received the gold medal of the Royal Humane Society (1818) for saving life at sea; adapted to the mercantile marine Sir Home Popham's system of signaling; was elected Fellow of the Royal Society in 1819, and was also something of a caricature artist. He is best known, however, for his stories of the sea, beginning in 1829 with 'The Naval Officer.' The most familiar of them is 'Midshipman Easy' (1836), in which his chief characteristics, lifelike and circumstantial narration and a rollicking humor, appear perhaps at their best. Others of the series are 'The King's Own' (1830), probably the best constructed of his works; 'Newton Forster' (1832); 'Peter Simple' (1834); 'Jacob Faithful' (1834); 'The Pacha of Many Tales' (1835); 'The Pirate, and the Three Cutters' (1836); 'Snarleyyow' (1837); 'The Phantom Ship' (1839); 'Poor Jack' (1840); 'The Privateer's Man' (1846). He wrote also a series of juveniles, chief of them 'Masterman Ready' (1841). He visited Canada and the United States in 1837–38; and recorded his impressions in 'A Diary in America' (1839), which gave some offense to the people of the nation, then hypersensitive to foreign criticism. In 1832–35 he edited the *Metropolitan Magazine,* in which he published a review of N. P. Willis' 'Pencilings by the Way,' which the latter, then in England, considered abusive. Willis challenged Marryat, and they exchanged shots at Chatham without injury. (See MIDSHIPMAN EASY, MR.). Consult Marryat, F., 'Life and Correspondence' (1872); Hannay, 'Life' (in 'Great Writers' series).

MARS, Anne Françoise Hippolyte Boutet Monvel, än fräṅ-swäz ē-pō-lēt boo-tā mōṅ-vĕl märs, usually called MADEMOISELLE MARS, French actress: b. Paris, 5 Feb. 1779; d. there, 20 March 1847. As Célimène in Molière's 'Misanthrope,' and Elmira in 'Tartuffe,' as well as in several similar characters in the plays of Marivaux, she was very great. Louis XVIII settled on her, as well as on Talma, a pension of 30,000 francs. She retired in 1841.

MARS, *in astronomy,* the outermost of the four earth-like planets revolving about the sun. Its orbit lies completely outside that of the earth, its mean distance from the sun being 141,500,000 miles, and with the single exception of the orbit of Mercury, it has the most eccentric orbit of the solar system, the greatest distance of the planet from the sun exceeding its least distance by 26,400,000 miles. Mars occupies 687 days in completing the circuit of its path, so that this is the length of the year on this planet. As the orbits of Mars and of the

earth both approximate to circles, having the sun near their centres, it follows that the distance apart of these planets varies enormously. When Mars, the earth and the sun are in one straight line, Mars and the earth being on the same side of the sun, this distance may be so little as 35,500,000 miles, while if the former planet is beyond the sun in the most remote part of its orbit, the distance may be so great as 248,600,000 miles. In the former case Mars is more favorably situated for observation from the earth than any other planet in the solar system; the planet Venus when nearest us is, indeed, much less far away, but at this time it is the dark, or night, side of Venus that is turned toward us, while when we are nearest to Mars it is the fully illuminated, day side of the planet upon which we look. On account of the eccentricity of the orbit of Mars, its distances from the earth differ greatly at different oppositions; if an opposition occurs while Mars occupies that part of its orbit which is nearest the sun, the distance may be so small as 35,500,000 miles, while if at this time Mars is at the point of its orbit most remote from the sun, even at the instant of nearest approach the distance may exceed 61,000,000 miles. The interval between successive close approaches of Mars and the earth is 780 days, much the longest synodical period in the planetary system, — while the usually favorable close approaches occur in groups separated by 15 or 17 years. These favorable oppositions always occur during the months of August or September; the date of the last one was 1909, while the three succeeding ones will be seen in the years 1924, 1939 and 1941. It is at these times that very unusually favorable opportunities are afforded for studying the surface of the planet. The day on Mars is 24 hours, 37 minutes, 22.67 seconds in length, being thus but little longer than our own; the axis of the planet is inclined at an angle of 24° 0′ to the axis of its orbit, so that spring, summer, autumn and winter succeed one another there in almost precisely the same way as with us, but the Martian seasons are each of nearly twice the duration of ours since the year is nearly two of our years in length. (The inclination of the earth's axis is 23° 27′).

In 1877, Asaph Hall, of Washington, discovered that Mars is attended by two minute satellites to which he gave the names Phobos and Deimos. Both of these bodies are very minute objects, and as may be seen from the following table their motions are in many respects unique among the satellites of the solar system.

The distance away of each of the moons from the planet is remarkably small; thus, even Deimos is less than one-seventeenth as far away from Mars as our own moon is from the earth, while Phobos is separated from the planet's surface by less than one diameter of the planet. The latter moon is, in fact, so close to Mars that it would remain forever invisible to any observers on the planet in higher latitudes than 69 degrees, being hidden by the curvature of the planet's surface. But still more striking is the apparent motion of these bodies as it would be witnessed from the surface of Mars itself. As Phobos completes a revolution in 7 hours 39 minutes, which is far less than the time of the rotation of the planet, it follows that this moon would be seen to rise in the west, run rapidly eastward among the stars and finally set in the east. Eleven hours later it would again appear in the west, to repeat the same retrograde motion. Deimos, though rising in the east in the usual way, would mount the sky very slowly: the various constellations would be seen to drift past it and the moon would not finally attain the western horizon until about 66 hours after rising. Both moons would be seen to go through their phases in the course of their peculiar motions. With such minute objects it is impossible for us to discern any measurable discs, but from observations of the amount of light which their surfaces reflect, their diameters can be, at least approximately, determined. The figures of the above table are those found in this way at the Lowell Observatory. These indicate that Phobos, as seen from the nearest point on Mars, would appear somewhat larger than our moon does to us, though its surface would be but one-half as bright, while the apparent diameter of Deimos would be but three minutes of arc. This satellite would therefore only be visible as a disc with difficulty to the naked eye; it would have merely the appearance of a very brilliant star.

In many ways Mars resembles our earth; it has atmosphere, seasons, storms, clouds and mountains. Vast white patches which have the appearance of snow and ice cover both its poles; these are found to vary in size with the seasons, being largest during the Martian winter, and sometimes even completely disappearing during the summer. The "Canalli," or channels, which have become known through the inexact English translation of Canals, were first mapped in large numbers by the Italian astronomer, Schiaparelli, although a few of them had been previously observed by other astronomers. They consist of narrow, dark lines, generally straight, forming a network over the whole surface of the planet. Some of the observers, however, deny the extreme regularity of these curious features, describing them as of varying widths and of a somewhat irregular appearance. At their junctions we often find small dark areas known as oases. Large darkish gray and green areas of the planet have

	Distance in equatorial radii of planet	Distance in miles	Time of revolution	Interval between meridian passage	Diameter in miles
Phobos	2.77	5,850	7h 39m 13.85s	10.9h	36
Deimos	6.92	14,650	30 17 54.87	181.5	10

been named seas, but it is now certain from the amount of permanent detail which is detected in them that they are not bodies of water. In fact, the course of many of the canals can be traced across these greenish areas. It is, indeed, certain that Mars approximates to a desert planet and that there is but little water on its surface. The greater area of the planet is of a yellowish or orange color and these regions are believed to be true deserts. It is thought by some of the students of the planet that the greenish areas are vegetation, that the canals are strips of irrigated country and that the polar caps are true deposits of snow or ice, the melting water of which is artificially led to dryer regions of the planet. To this explanation many astronomers vigorously dissent, their objections being principally based on the extremely light atmosphere of the planet, its probable very low temperature, and especially upon the uncertainties still remaining in our ideas of the appearance of the Martian surface and in the interpretation of what has been seen. It is to be hoped that at the very favorable oppositions of 1924, 1939 and 1941 a more definite basis may be acquired for extending our knowledge in this fascinating field. The reader will find tolerably complete statement of the known and supposed facts and of the various inferences drawn from them among the titles given below. Consult Flammarion, Camille, 'La Planète Mars et ses conditions d'habitilité' (1892); Lowell, Percival, 'Mars and its Canals' (1906), and 'Mars as the Abode of Life' (1909); Wallace, Alfred Russell, 'Is Mars Inhabited?' (1907).

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MARS, the typical god of war; *in Roman mythology,* contracted from *Mavers* or *Mavors,* in the Sabine or Oscan language *Mamers,* was at an early period identified by the Romans with the Greek *Ares.* As the Italian Mars was originally a divinity of a very different nature, the two conceptions must be treated separately. Originally Mars was an agricultural deity surnamed *Silvanus,* and propitiatory sacrifices were offered to him as the tutelary god of fields and flocks. As the Italian shepherds were familiar with war, the transition from the idea of Mars as an agricultural to that of a warlike deity was natural and easy. He was regarded as the father of the Roman people, for, according to tradition, Romulus and Remus, the founders of Rome, were the fruit of his intercourse with Rhea Sylvia. Several temples in Rome and the Campus Martius were dedicated to him, the most important of which was that outside the Porta Capena, on the Appian Road, and that of Mars Ultor, built by Augustus in the forum. His service was celebrated not only by particular *flamines* devoted to him, but by the College of the Salii, or priests of Mars. The month of March (q.v.), the first month of the Roman year, was sacred to him and his festivals were celebrated every year in the Circus on the 1st of August. The Campus Martius, where the Roman youth engaged in athletic and military exercises, was named after him. (See ARIES). Consult Fairbanks, A., 'Mythology of Greece and Rome'. (1907).

MARSALA, mär-sä'lä, Sicily, a seaport town, near the mouth of a river of the same name, on the low promontory of Cape Boeo, 18 miles southwest of Trapani. It was known as Lilybæum in the time of the Carthaginian supremacy. It obtained its present name from the Saracens, who valued the port so highly that they called it Marsa Alla, or Port of God. It has now excellent schools of technology and agriculture and a large public library. The harbor has been greatly improved. The most important export is Marsala wine, which resembles sherry; grain, soda and salt are also exported. Pop. of commune, 65,451.

MARSDEN, märz'dĕn, **Samuel,** Anglo-Australasian missionary: b. Horsforth, near Leeds, 28 July 1764; d. Windsor, New South Wales, 12 May 1838. After study at Cambridge and ordination in 1793, he went in 1794 as chaplain to the convict settlement at Parramatta, Australia, where his model farm became self-supporting and contributory to the development of local schools and missions. In 1814 he extended his work to New Zealand among the Maoris who through his efforts became Christianized, received a dictionary and grammar of the Maori language and adopted a fixed form of government. Consult Marsden, J. B., 'Life of Samuel Marsden' (London 1859).

MARSEILLAISE, La, the French national anthem, a revolutionary song, composed by an engineer officer, Rouget de Lisle, during the night of 24–25 April 1792 in Strassburg. The song quickly spread. The people of Marseilles adopted it to be sung at the meetings of their clubs. It was they who carried it all over France, and hence from them it received its name. De Lisle was a proscribed royalist at the time. His mother wrote to him in alarm, asking, "What is this revolutionary hymn, sung by bands of brigands who are prowling through France and with which our name is linked?" He had originally given it the name of 'Le chant de guerre pour l'armée du Rhin' ('Battle Song of the Rhine Army'). Lamartine wrote that De Lisle himself was terrified at the tremendous effect of his composition: "It was the fire-water of the Revolution, which instilled into the senses and soul of the people the intoxication of battle." Carlyle describes it as "the luckiest musical composition ever promulgated, the sound of which will make the blood tingle in men's veins; and whole armies and assemblages will sing it, with eyes weeping and burning, with hearts defiant of Death, Despot and Devil." On 8 Jan. 1795 the Directory ordered the air to be played at all theatres. Its inspiring strains are known throughout the world more than perhaps any other melody. During the Empire and the Restoration the Marseillaise was suppressed as a revolutionary demonstration, but was revived with the July Revolution of 1830. The original version consisted of only six couplets; the seventh was added when it was dramatized for the Fête de la Fédération, in order to complete the characters among whom the verses were distributed, namely, an old man, a soldier, a wife and a child. The stanza commencing with "Nous entrerons" is the one added, intended for the child part. It was written by Dubois, editor of the *Journal de la Littérature.* The complete version follows, with a strict translation.

LA MARSEILLAISE.

1

Allons, enfants de la Patrie,
Le jour de gloire est arrivé;
Contre nous de la tyrannie,
L'étendard sanglant est levé.
Entendez – vous dans ces campagnes
Mugir ces féroces soldats?
Ils viennent jusque dans vos bras
Egorger nos fils, nos compagnes!
Aux armes, citoyens! formez vos bataillons!
Marchons, marchons,
Q'un sang impur abreuve nos sillons!

2

Que veut cette horde d'esclaves,
De traîtres, de rois conjurés?
Pour qui ces ignobles entraves,
Ces fers dès longtemps préparés?
Français, pour nous, ah! quel outrage!
Quels transports il doit exciter!
C'est nous qu'on ose méditer
De rendre à l'antique esclavage.
Aux armes, etc.

3

Quoi! ces cohortes étrangères
Feraient la loi dans nos foyers?
Quoi! ces phalanges mercenaires
Terrasseraint nos fiers guerriers?
Grand Dieu! par des mains enchaînées
Nos fronts sous le joug se ploieraient!
De vils despotes deviendraient
Les maîtres de nos destinées.
Aux armes, etc.

4

Tremblez, tyrans, et vous perfides,
L'opprobre de tous les partis,
Tremblez! vos projets parricides
Vont enfin recevoir leur prix!
Tout est soldat pour vous combattre.
S'ils tombent, nos jeunes héros,
La terre en produit de nouveaux
Contre vous tout prêts à se battre!
Aux armes, etc.

5

Français, en guerriers magnanimes,
Portez ou retenez vos coups;
Épargnez ces tristes victimes
A regret s'armant contre nous.
Mais ces despotes sanguinaires,
Mais les complices de Bouillé,
Tous ces tigres qui sans pitié
Dechirent le sein de leurs mères!
Aux armes, etc.

6

Nous entrerons dans la carrière
Quand nos aînés n'y seront plus;
Nous y trouverons leur poussière
Et la trace de leurs vertus!
Bien moins jaloux de leur survivre
Que de partager leur cercueil,
Nous aurons le sublime orgeuil
De les venger ou de les suivre!
Aux armes, etc.

7

Amour sacré de la Patrie,
Conduis, soutiens nos braves vengeurs;
Liberté, Liberté, chérie,
Combats avec tes défenseurs!
Sous nos drapeaux que la Victoire
Accoure à tes mâles accents;
Que tes ennemis expirants
Voient ton triomphe et notre gloire!
Aux armes, etc.

THE MARSEILLAISE.

1

Come, children of the fatherland,
The day of glory now is here;
By tyranny against us
The bloody banner is raised:
Do you hear in the land
Those ferocious soldiers roar?
Up to our arms they come,
Strangling our sons, our women!
To arms, citizens, form your battalions,
Let us march, let us march!
That the foul blood may drench our furrows!

2

What seeks this horde of slaves,
Of traitors and conspiring kings?
For whom these base manacles,
These irons already long prepared?
For us, Frenchmen, ah, such outrage!
What passions it must raise!
'Tis us whom they dare purpose
To restore to former slavery.

3

What! shall these foreign cohorts
Make the law in our homes?
What! shall these hireling phalanxes
Throw our proud warriors down?
Great God! with fettered hands,
Our heads bowed down beneath the yoke!
And despots vile become
The masters of our destinies.

4

Tremble, ye tyrants and traitors,
The shame of every faction,
Tremble! your parricidal projects
Shall at last gain their reward!
Each one is soldier to fight you.
And if our young heroes fall,
The land shall produce them afresh
All ready to struggle against you!

5

Frenchmen, as magnanimous warriors,
Restrain or deal your blows;
Spare those sad victims
Who reluctantly armed against us.
But those bloody despots —
Those accomplices of Bouillé —
All those tigers who pitilessly
Lacerate the bosoms of their mothers!

6

We shall begin our career
When our elders are no more;
Yet we shall find their ashes
And the trace of their virtues!
Less eager to survive them
Than to share their tomb,
It shall be our sublime pride
To avenge or follow them!

7

Sacred love of fatherland,
Guide, sustain our brave avengers;
Liberty, dear Liberty,
Fight with thy defenders!
That victory under our flags
Shall hasten to thy noble call;
And may thy dying enemies
Behold thy triumph and our glory!

MARSEILLES, mär-sālz, or **MARSEILLE,** mär-sā-yĕ, France, the principal commercial seaport of the country, a first-class military and naval station, the second city of France as regards population, and the capital of the department of Bouches-du-Rhône, 508 miles southeast of Paris. It stands on the northeastern shore of the Gulf of Lyons, and on a bay containing a group of islets, one of which, the Château d'If, has world-wide celebrity in connection with the elder Dumas' 'Monte Cristo.' The city is strongly defended by various works, and lies in the form of an amphitheatre round a natural harbor of moderate size (about 70 acres), known as the Old Harbor. From the Old Harbor one of the finest of the city thoroughfares, called the Cannebière, runs inland in a straight line; while at right angles to this another great thoroughfare traverses the city, planted with trees, lined with fine edifices and bearing different names at different points. In the older

part of the town the streets are narrow and irregular, but in general the streets are spacious and regular and lined with handsome houses. Marseilles, however, is not rich in public edifices. The chief are the large cathedral, in the Byzantine style, consecrated in 1893; the church of Notre Dame de la Garde, a modern Romanesque building, on a hill of same name, whence a splendid view is obtained; the church of Saint Victor, a building of great antiquity; the Hôtel de Ville; the Prefecture; the Palais des Arts de Longchamp, containing a picture-gallery and natural history museum; the exchange; the public library (120,000 vols.); the palace of justice or law courts; the episcopal palace, etc. Marseilles is the seat of a bishop and possesses a court of first instance, a mint, an Academy of Sciences, Belles-lettres and Arts, various learned societies and educational institutions.

Marseilles improved greatly in regard to street architecture, sanitary matters, etc., and made great progress in extent, population and commerce, largely owing to the conquest of Algeria and the opening of the Suez Canal. Including Old and New Harbors, the total water area is 414 acres; there are seven wet docks, with depths at ordinary tides ranging from 25 to 66 feet, six dry docks and 13 miles of quayage. Vessels entered in 1913, 4,621, of an aggregate of 8,308,165 tons. The traffic in merchandise has grown from 4,372,000 tons in 1870 to 21,590,000 tons in 1913. From the Durance an abundant water supply has been derived. A canal irrigates the neighboring slopes and plains and has transformed them from arid tracts into fruitful fields. The surrounding districts are now occupied by new population, employed in raising vegetables, fruit, etc., on the reclaimed and improved lands. The Marseilles-Rhone Canal, intended to open up waterways from Marseilles to the interior of France and central Europe, was authorized in 1903, and is expected to be completed in 1919. The canal, which is 50 miles long, has no locks and is at sea-level throughout its entire course, and will, with its tributaries, form a series of waterways 350 miles long, navigable by heavy barges. The most important manufactures are soap, soda and other chemical products; also olive and other oils, sugar, machinery, iron and brass work, matches, candles, glass, earthenware, Oriental hosiery, etc. In the building-docks a great number of war and other vessels are built. The trade consists chiefly of soap, olive-oil, wine, brandy, corn, flour, dried fruits, oranges and other products of the southern departments; salt provisions, tobacco, wool, skins and hides, iron, raw cotton, cotton twist, dye-woods and American novelties. Marseilles is the headquarters of the 15th army corps and is the seat of a United States consulate. During the European War 1914–18 it was a center of great naval activity a chief port of debarkation for the world-converging armies of the Entente Allies.

Marseilles was founded by a colony of Greeks from Asia Minor about 600 years before Christ, the original name being Massalia, and the Greek language is said to have been spoken here for several centuries before Christ. Its progress for centuries was rapid and almost without interruption. Having taken the part of Pompey in the great contest for supremacy between him and Cæsar, it was besieged by the latter and taken in 49 B.C. On the decline of the Roman Empire it became a prey to the Goths, Burgundians and Franks. In 735 it fell into the hands of the Saracens, who completely destroyed all the ancient monuments which the barbarians had spared. In the 10th century it fell under the dominion of the counts of Provence and for some centuries after followed the fortunes of that house. Pop. 550,619.

MARSEILLES, Ill., city in La Salle County, situated on the Illinois River and Michigan Canal and on the Chicago, Rock Island and Pacific and the Chicago, Ottawa and Peoria railroads. It has coal mines and numerous industrial establishments, including paper-box factories, roofing material works, paper-board works, agricultural implement works, concrete block yards and cigar factories. The Illinois River is crossed at this point by a great railroad bridge. The commission form of government was instituted in 1913. Pop. 3,290.

MARSH, George Perkins, American scholar and diplomat: b. Woodstock, Vt., 15 March 1801; d. Vallombrosa, Italy, 23 July 1882. He was graduated at Dartmouth in 1820; studied law at Burlington; was elected to the Supreme Executive Council of Vermont in 1834; sat in Congress from 1842 to 1849, when he went to Constantinople as Minister for four years, and in 1852 was sent on a special mission to Greece. In 1861, after seven years in the United States, he went to Italy as Minister, and held that post until his death. An able English philologist, Marsh wrote 'Lectures on the English Language' (1861); 'The Origin and History of the English Language' (1862); 'Man and Nature,' in which he urged forest planting and forest preservation (1864), etc. He edited Wedgewood's 'Etymology,' and translated Rask's 'Icelandic Grammar.' Consult the 'Life and Letters' edited by his widow (1888).

MARSH, Othniel Charles, American palæontologist: b. Lockport, N. Y., 29 Oct. 1831; d. New Haven, Conn., 18 March 1899. He was graduated from Yale in 1860, studied in 1860–62 at the Yale (now the Sheffield) Scientific School, in 1862–65 at the German universities of Berlin, Heidelberg and Breslau, and from 1866 until his death was the first professor of palæontology at Yale. From 1882 he was vertebrate palæontologist to the United States Geological Survey, his field-work for the survey ceasing in 1892. His investigations in regard to extinct vertebrates are very important and were declared by Charles Darwin to furnish some of the most satisfactory evidence of the evolutionary theory. He made particular study of the Rocky Mountain region, and from 1868 almost annually organized and conducted expeditions into that district. In these explorations he discovered over 1,000 new fossil vertebrates, of which he classified and described more than one-half. Among his discoveries are those of the *Odontormithes,* a subclass of Cretaceous birds, with teeth; the *Dinocerata,* ungulate animals of the Eocene period, elephantine in size; the first known American pterodactyls, or flying lizards, and several new families of dinosaurs. Perhaps he was best known for his study of the primitive horse, the *Eohippus, Orohippus* and *Epihippus.* In 1890–99 he made

researches in the geology of the region between the Appalachian range and the Atlantic. He was curator of the geological collection of the Yale Museum of Natural History in 1867–99, and in 1898 presented to the university his own collections. He was a nephew of George Peabody (q.v.), and it is said to have been at his suggestion that the Peabody Museum at Yale was established. In 1887 he was made honorary curator of vertebrate palæontology in the United States National Museum, and in 1898 received the Cuvier medal of the French Academy of Sciences. He was president of the American Association for the Advancement of Science in 1878 and of the National Academy of Sciences in 1883–95. From a bibliography of 237 titles these works by him may be cited: 'Odontornithes: A Monograph of the Extinct Toothed Birds of North America' (1880); 'Dinocerata: A Monograph of an Extinct Order of Gigantic Mammals' (1884), and 'The Dinosaurs of North America' (1896). Consult memoir by C. E. Beecher in the *American Journal of Science,* June 1899.

MARSH, Sylvester, American engineer: b. Campton, N. H., 30 Sept. 1803; d. Concord, N. H., 30 Dec. 1884. In 1826 he established a provision business in Boston, in 1833 in Chicago and from 1837 was in the grain trade at Chicago. He originated the meat-packing industry and is regarded as one of the founders of Chicago. From 1864 he resided in New Hampshire. On 25 June 1858, he obtained a charter for a railway to the summit of Mount Washington, a project deemed so impossible that he was called "crazy Marsh." The railway, 2.81 miles long, with an ascent of 3,625 feet, was completed in July 1869. The chief feature in the operation of the road is a central cog-rail. The principle proved so practicable that literally hundreds of similar railways have been constructed on the sides of famous mountains all over the world.

MARSH CROCODILE, or **MUGGER,** the common inland crocodile of India, locally venerated by the Hindus, to whom it is known as "Mugger." It inhabits the tanks and marshes of India and Ceylon, and suitable places westward almost to the Persian coast and eastward throughout the Malay Peninsula and islands. It is dark, olive-brown in general color above, lighter on the ventral surface; the young are paler, with black spots. A specimen 12 feet long is considered large, but instances of a length of 18 feet have been recorded. The head is rough-coated, but has no ridges; the snout is broad and the teeth number 76. These crocodiles swarm in river-marshes, weedy ponds and artificial reservoirs, throughout their range, feeding on fish and small animals, and little feared by horses, cattle or human beings, for in general they are cowardly and reluctant to attack men or even to resist injury. In case the water of their home dries away, they migrate to other pools, and in seasons of drought are likely to be met with anywhere wandering in search of water; as a last resort they will bury themselves in the mud and remain in torpor until revived by the coming of rains. These reptiles display considerable cunning in capturing their food and in avoiding harm, feigning death very cleverly. They are kept in a semi-domesticated condition in many parts of India by pious Hindus, whose priests build temples near the great ponds, protect and feed the reptiles and imagine the service pleasing to the gods as well as profitable to themselves. Extensive descriptions of the animal and of its worship may be found in the zoological works of Blanford, Jerdon, Tennent, Gadow and others and in such volumes as Adams, 'Wanderings of a Naturalist in India' (Edinburgh 1867) and Hornaday, 'Two Years in the Jungle' (New York 1885).

MARSH GAS. See METHANE.

MARSH HARE. See HARES.

MARSH HAWK, or **HARRIER,** a migratory hawk (*Circus cyaneus*) of medium size, commonly known in one or another of its varieties throughout the north temperate zone, which frequents marshy meadows, where it makes its nest upon the ground in a tussock of grass, and lays five to seven roundish, dirty white eggs. In such places it finds its food, chiefly mice and frogs, and sails slowly back and forth close to the ground watching keenly for movements in the grass and ready to pounce upon its prey. Its wings are long and its flight may be swift and powerful when occasion demands, but it was accounted "ignoble" among falconers. It rarely seizes birds or even young poultry, although one of its names is "hen-harrier," and should be protected and encouraged by farmers as one of the most useful and persistent mousers. This hawk may be readily recognized by the broad patch of white on the rump displayed by both sexes. The male is dull grayish-blue, in general tint, and the female rusty brown, both streaked with white. The American harrier (*C. hudsonius*) is generally brown, though the adult males are blue-gray on the back; the tail-coverts are white. Consult Coues, 'Birds of the Northwest' (1874).

MARSH-HEN. See MUD-HEN.

MARSH MALLOW, a coarse, large leaved herb (*Althea officinalis*), of the Old World, but naturalized in marshy places along the eastern coast of the United States, which is related to the hollyhocks (q.v.); the flowers are pale rose-color, some in a terminal spike and some axillary. Its root is mucilaginous and of service as a demulcent in medicine, but it is mainly used as a basis for the confection called "marsh mallow." See MALLOW.

MARSH-MARIGOLD. See COWSLIP.

MARSH-WREN, either of two species of American wrens that inhabit reedy marshes. They have the diminutive brown bodies, short wings and tails, the latter often held cocked up over the back, awl-like bills and inquisitive activity characteristic of wren (q.v.) generally. One is the long-billed (*Cistothorus palustris*), most numerous in the salt-marshes along the Atlantic coast; and the other the short-billed, better known about inland lakes and rivers. The former is somewhat the larger, has a decidedly longer bill and lays eggs dark chocolate in color, while the eggs of the short-billed species are pure white. Both make elaborate nests in the form of ball-like baskets, with a little entrance at the side, woven of leaves of wild rice or marsh grasses and fastened to the stems of the reeds. A curious habit of the species is that each pair will make several nests

each season, only one of which serves the purposes of incubation. These wrens give in the spring an exceedingly pretty clattering song and when dozens are singing together in a patch of reeds the effect is most pleasing.

MARSHAL, a Federal officer appointed by the President in each judicial district and corresponding to the sheriff of a county. His duty is to execute all precepts directed to him, issued under the authority of the United States, and is under the jurisdiction of the United States District and Circuit Courts. The United States government maintains marshals in its principal dependencies, as the Philippines, Alaska, Porto Rico, Hawaii, etc. They are appointed by the President for four years, and in addition to serving the courts have certain duties regarding internal revenue, public lands and the postal service. Sometimes the chief of police in American towns is known as marshal. In some European countries the title of marshal confers the highest military distinction, that of Marshal of France being especially prized. The word is derived from the Old High German word *marah,* a horse; and *scalh,* a servant; hence *Marascalh,* a man appointed to take care of horses. The marshal of the German Empire derived his origin from the Frankish monarchs and was equivalent to the *comes stabuli* or *connétable.* He was bound to keep order at the coronation of the emperor, and to provide lodgings for the persons connected with the ceremony. He was called *arch-marshal,* a dignity belonging to the electorate of Saxony. At the coronation it was his duty to bring oats in a silver vessel from a heap in the open marketplace, and to present the vessel to the emperor. His duties were discharged by a hereditary marshal (*Erbmarschall*). In Prussia general field-marshal is the highest military honor. In England field-marshal is given as an honorary rank to general officers who may have no immediate command. Marshal also signifies a person who regulates the ceremonies of certain solemn celebrations or, as in the United States, at parades, street processions, etc.

MARSHAL, Frank, American chess champion: b. Brooklyn, N. Y., 1877. He acquired fame when a mere boy by winning the championship of the famous Brooklyn Chess Club. Next he took the championship of the Manhattan Chess Club. Thereafter he became a professional player and entered in most of the international tournaments. In 1905 he won the International Chess Tourney at Cambridge and challenged Lasher for the World's championship, but was defeated. In all he won first prize in seven international tourneys. He won the Pan-American championship by defeating Copablanca in Cuba in 1912, though he lost a set match to Copablanca a year or two previous. He succeeded Showalter as United States champion.

MARSHALL, mär'shal, **Alfred,** English economist: b. London, 26 July 1842. He was educated at Saint John's College, Cambridge, and in 1877 was principal of University College, Bristol. In 1883–84 he was lecturer at Balliol College, Oxford, from 1885–1908 he was professor of political economy at Cambridge University, and a member of the Royal Commission on Labor in 1891. He has published 'Economics of Industry' (1879); 'Principles of Economics' (1890); 'Elements of Economics' (1891); 'Fiscal Policy of International Trade' (1903), etc.

MARSHALL, (Davis) Edward, American author and journalist: b. Enfield Centre, Tioga County, N. Y., 31 May 1869. He was educated at Benedict's Preparatory School, Rochester; was news editor of the American Press Association at Buffalo and New York in 1885–89; Sunday editor of the New York *Press* 1890–95. In 1897 he was Sunday editor of the New York *Journal* and European correspondent of the New York *World* 1897–98, and in the latter year served as war correspondent of the New York *Journal.* He was correspondent of the First Peace Conference at The Hague 1900. In New York he conducted an editorial crusade against the conditions existing in tenement buildings, was secretary of the New York State Tenement-House Commission 1894, and has lectured on the Spanish-American War, the army, the Latin Quarter of Paris, etc.; was correspondent of the *Columbian Magazine* during the Mexican insurrection of 1911. He has published 'Story of the Rough Riders' (1898); 'Lizette' (1902); 'The Middle Wall' (1904); 'The Writing on the Wall' (1909); 'In Old Kentucky,' with C. T. Dazey; 'Bat: An Idyl of New York' (1912), and novel versions from the following plays: 'The Family'; 'Master of the House' (1912); 'Broadway Jones' (1913), and several short stories.

MARSHALL, Emma Martin, English novelist: b. North Repps, near Cromer, Norfolk, 29 Sept. 1830; d. Clifton, near Bristol, 4 May 1899. She was married to H. G. Marshall in 1851, and her life thereafter was mainly spent in the cathedral cities of Wells, Exeter, Gloucester and Bristol. She wrote more than 200 stories, nearly all of them stories intended mainly, though not entirely, for young people. In spite of their number the even excellence of the tales is remarkable; they possess high moral tone, and they may be called historical pictures rather than historical tales. Her plan was to introduce into each story several historical personages, as secondary characters, the principal figures being imaginary. Her books have had a wide reading in the United States and still continue popular. Among them are 'Life's Aftermath' (1876); 'Under Salisbury Spire' (1889); 'Haunts of Ancient Peace'; 'Penshurst Castle' (1894); 'Under the Dome of St. Paul's' (1898). Consult Marshall, B., 'Life of Emma Marshall' (1900).

MARSHALL, Henry Rutgers, American author and architect: b. New York, 22 July 1852. He was graduated at Columbia in 1873, and in 1878 entered practice as an architect. He was lecturer on æsthetics at Columbia in 1894–95 and at Princeton in 1915–16. He was president of the New York Chapter of the American Institute of Architects 1902–04, and president in 1907 of the American Psychological Association. While eminent as an architect he has become more widely known through his psychological writings. In 1902 he was appointed a member of the Art Commission of the city of New York. Besides contributions to literary, philosophical and psychological periodicals he wrote 'Pain, Pleasure and Æsthetics' (1894); 'Æsthetic Principles' (1895); 'Instinct and Reason' (1898); 'Con-

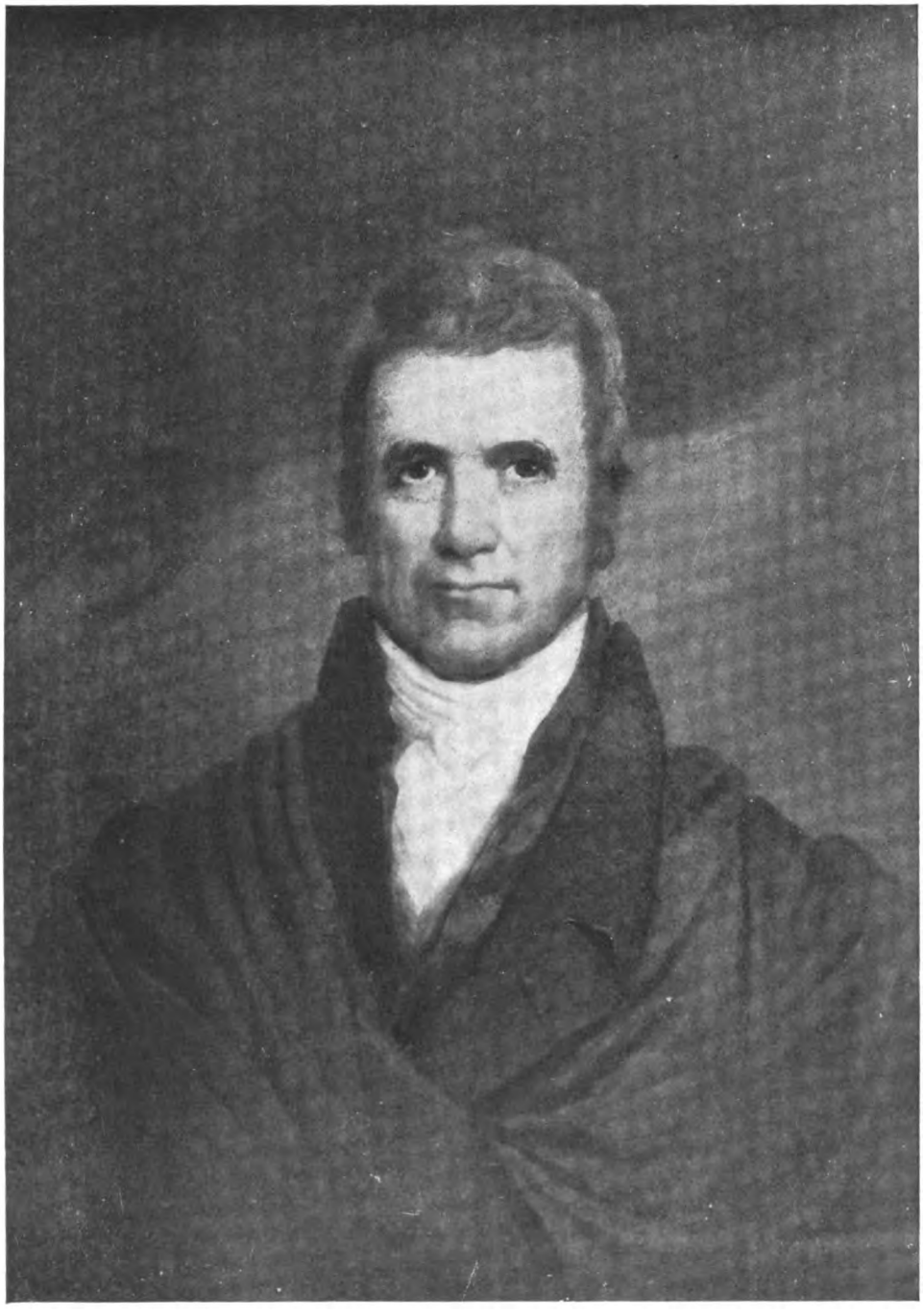
sciousness' (1909), and 'War and the Ideal of Gene' (1915); 'Mind and Conduct' (New York 1919).

MARSHALL, Humphrey, American botanist: b. West Bradford (the present Marshallton), Pa., 10 Oct. 1722; d. there, 5 Nov. 1801. He followed the stonemason's trade, but devoted his leisure to astronomy, building a small private observatory, and to natural history. He began the collection and cultivation of the more interesting indigenous plants, and in 1773 established the Marshallton botanical garden, where were assembled trees and herbaceous plants of the United States. For years he was treasurer of Chester County, Pa., and in 1786 he was elected to the American Philosophical Society. His 'Arboretum Americanum,' described as "an Alphabetical Catalogue of Forest Trees and Shrubs, Natives of the American United States" (1785), was translated into several European languages.

MARSHALL, Humphrey, American politician: b. Westmoreland County, Va., 1756; d. near Frankfort, Ky., 1 July 1841. He joined the Continental army at the outbreak of the Revolution, became captain of Virginia cavalry (1778), in 1780 established himself on a Kentucky plantation, opposed the separation of Kentucky from Virginia, and as a delegate to the Danville convention of 1787 was prominent in defeating the measure. He was also a delegate to the Virginia convention that ratified the Constitution of the United States, and in 1793 was a representative from Woodford County in the Kentucky legislature, where he declared his opposition to the plans for raising in Kentucky troops under Gen. George Rogers Clark for an attack on the Spanish settlements near the mouth of the Mississippi River. From 7 Dec. 1795 to 3 March 1801 he was a Federalist senator in the Congress of the United States, and in 1806 was active in denunciation of Aaron Burr. He represented Franklin County in the Kentucky legislature in 1807–09, and had a dispute with Henry Clay which resulted in a duel in which Clay received a slight wound. He sat again for Franklin County in 1823. He published the first 'History of Kentucky' (1812; rev. ed., 1824).

MARSHALL, Humphrey, American soldier: b. Frankfort, Ky., 13 Jan. 1812; d. Louisville, Ky., 28 March 1872. He was graduated from the United States Military Academy in 1832, entered the mounted rangers, served in the Black Hawk War (1832) and resigned from the army 30 April 1833. Admitted to the bar in 1833, he practised in Frankfort (1833–34) and Louisville (1834–36), became a lieutenant-colonel of Kentucky militia in 1841, and raised for the Mexican War the first regiment of Kentucky cavalry, of which he was made colonel 9 June 1846. He fought at Buena Vista (22–23 Feb. 1847). From 3 Dec. 1849 to 4 Aug. 1852 he served as a Whig in the 31st and 32d Congresses, in 1852–54 was Minister Plenipotentiary to China, and from 3 Dec. 1855 to 3 March 1859 was again in Congress, this time as an American, or Know-Nothing. In 1861 he was commissioned a brigadier-general in the Confederate army, with command of the Army of Eastern Kentucky. On 10 Jan. 1862 he was defeated by General Garfield at Middle Creek (Floyd County) in one of the most important of the minor battles of the Civil War. In May 1862 he surprised Gen. J. D. Cox at Princeton, Va., and was thus of much service to Lee, through the relief of the Lynchburg and Knoxville Railway. Having resigned his commission in 1862 he represented Kentucky in the congress of the Confederate States (1863–65). From 1867 he practised law with much success at Louisville.

MARSHALL, John, chief justice of the United States: b. Germantown (now Midland), Fauquier County, Va., 24 Sept. 1755; d. Philadelphia, 6 July 1835. He was the eldest son of Col. Thomas Marshall of Westmoreland County, Va., a distinguished officer in the French War and in the War of Independence, and of Mary Keith, a member of the well-known Randolph family. Thomas Marshall removed from Westmoreland County to Fauquier soon after his marriage; this community was sparsely settled and the educational advantages which he could give his children were meagre, consequently he became their earliest teacher and succeeded in imbuing them with his own love of literature and of history. For two years John Marshall had, as tutor, James Thompson of Scotland and he was sent for one year to the academy of the Messrs. Campbell of Westmoreland County, where James Monroe was also a pupil. He had no college training except a few lectures on law and natural philosophy at William and Mary in 1779. He was always fond of field sports and excelling in running, leaping and quoit throwing. He loved the free natural life of the country, and his long tramps through the woods around his father's home, Oak Hill, together with his athletic exercises gave him great strength and agility. At 18 he began the study of law, but soon left his studies to enter the Revolutionary army. He was active in endeavoring to enlist men for the service and helped to form and drill a company of volunteers. As a member of his father's regiment he took part in the battle of Great Bridge where he displayed signal valor. In 1776 he became a lieutenant in the 11th Virginia, and the next year was made captain. He served in Virginia, New Jersey, Pennsylvania and New York, always displaying great courage and valor and a cheerful acceptance of hardships and privations. This experience was of untold value to Marshall, it broadened his views and quickened his insight in governmental questions. As he says, he entered the army a Virginian and left it an American. In 1780 during a period of military inactivity he attended a course of law lectures at William and Mary and in 1781, after leaving the army, was granted a license and began the practice of law in Fauquier County. The next year he was elected to the Virginia assembly, and shortly afterward was made a member of the executive council. He served his State as legislator during eight sessions. In 1784, although he had then removed his residence to Richmond, he was again elected delegate from Fauquier County, and in 1787 served as member from the county of Henrico. When the city of Richmond was granted a representative in the legislature Marshall had the honor of this office which he held from 1788 to 1791. He was also a member of the Federal Convention which met in 1788 to discuss the ratification of the Constitution of the United States,



JOHN MARSHALL

Chief Justice United States Supreme Court

and it was largely due to his convincing arguments that ratification was carried, as the question was hotly debated and the anti-Constitution party had able and determined representatives. For several years he held no public office and devoted himself entirely to his extensive law practice, but in 1795 was again elected to the legislature. During this session he defended the unpopular "Jay Treaty" with England, and by his overwhelming arguments completely refuted the theory of his opponents that the executive has no power to negotiate a commercial treaty. Marshall's attitude during his service as legislator toward all questions concerning Federal power demonstrated his increasing belief that a strong central government is necessary to real efficiency. In 1783 he had married Mary Ambler, daughter of Jacqueline Ambler, treasurer of the State, and soon after his marriage made his permanent home in Richmond. The honors bestowed on him testify to the esteem in which he was held by the State and by the nation. He refused the Attorney-Generalship and the Ministry to France, but in 1789 accepted the office of Special Envoy to France with Charles Cotesworth Pinckney and Elbridge Gerry. This mission related to the indignities which the French had offered the American navy and attempted to adjust the commercial relations between the two countries. It failed on account of the arrogant attitude of France, but "Marshall's dignified correspondence added greatly to the prestige of America," and on his return he was welcomed with many evidences of approbation from his grateful countrymen. Yielding to the earnest solicitation of Washington he became a candidate for Congress and was elected a member of that body in 1798. In Congress he was the leader of the Administration party and the greatest debater in the House on all constitutional matters. In one of his most noted speeches he defended the action of President Adams in the case of Jonathan Robbins and proved conclusively that this case was a question of executive and not of judicial cognizance. In 1800 he was made Secretary of State, and in 1801 appointed chief justice of the United States, which office he held until his death in 1835. In 1829 he, like ex-Presidents Madison and James Monroe, was a member of the Virginia convention which met to alter the State constitution, and by his wisdom and moderation did much to prevent radical changes and to thwart the attempts of politicians against the independence of the judiciary. In 1831 his health, hitherto unusually vigorous, began to fail; he underwent a severe surgical operation in Philadelphia and was seemingly restored, but the death of his wife was a great shock and a return of the disease in 1835 proved fatal. He died in Philadelphia, whither he had gone for medical relief, and was buried by the side of his wife in the New-Burying-Ground, now Shockhoe Hill Cemetery, Richmond. The sorrow over the country was deep and widespread; even his bitterest enemies mourned for the kindly, upright man.

Though somewhat ungainly, Marshall was always dignified in appearance; his tall, loosely-jointed figure gave an impression of freedom, while his finely shaped head and strong, penetrating eyes bespoke intelligence and power. Directness and simplicity were his dominant characteristics. He was free from any display of pomp, air of office or studied effect. His unfailing good humor, his benignity, his respect for women, his devotion to wife and family and his well-known reverence for religion made him loved and admired even by those who heartily disliked his political opinions. As chief justice for more than 30 years he rendered numerous decisions which were of prime importance to a nation in process of formation. The faculty which made Marshall invaluable as a jurist was his power of going directly to the core of any matter. No subtleties, no outside issue confused him, his analysis was unerring, his logic incontrovertible; he cared nothing for the graces of rhetoric and made no appeal to the emotions; his power lay in his deep conviction and in his illuminating and progressive argument. At a period when the powers of the Constitution were ill-defined, when our government was experimental, Marshall's decisions in constitutional and international cases were invaluable factors in forming a well-organized Federal government. "He made the Constitution live, he imparted to it the breath of immortality, and its vigorous life at the present hour is due mainly to the wise interpretation he gave to its provisions during his long term of office." Marshall was the author of numerous reports and papers, of a history of the colonies and of a 'Life of Washington,' a book of small literary merit, but containing a mass of valuable authentic information. Consult Cooley, 'Constitutional History of the United States' (1889); Margruder, 'John Marshall' (1885); Thayer, 'John Marshall' (in 'Beacon Biographies' series, 1901); Beveridge, A. J., 'Life of John Marshall' (1916).

EMILIE W. MCVEA,
President of Sweet Briar College.

MARSHALL, Louis, American lawyer: b. Syracuse, N. Y., 14 Dec. 1856. He was educated in the Syracuse public and high schools and at the law school of Columbia University. In 1878 he began practice at Syracuse. He is now member of the firm of Guggenheimer, Untermeyer and Marshall. He has argued many importing causes in the higher courts, specializing especially in constitutional and corporation law. Mr. Marshall was a member of the New York Constitutional conventions of 1890, 1894 and 1915; served on the commission appointed by Mayor Low, in 1902, to investigate East Side conditions; chairman of the State Immigration Commission appointed by Governor Hughes in 1908 and counsel for William Sulzer in his impeachment trial. Mr. Marshall was also counsel for Leo M. Frank in the United States Supreme Court. He was prominent in the movement for the abrogation of the treaty of 1832 with Russia. He was mediator in settling the cloakmakers' strike in 1910, and prepared the protocol of settlement which has since been the basis of numerous strike adjustments. He has taken an active part in Jewish charitable work and has lectured before many learned and philanthropic societies. Mr. Marshall has been a trustee of Syracuse University since 1910.

MARSHALL, Orsamus Holmes, American lawyer and author: b. Franklin, Conn., 1813; d. 1884. In 1831 he was graduated at Union College, studied for the bar, to which he was admitted in 1834. He was one of the founders of the Buffalo Female Academy and

of the Buffalo Historical Society. He also served several years as chancellor of the University of Buffalo. He wrote much in connection with the Iroquois dealings with the whites. Posthumously there appeared a volume entitled 'Historical Writings of Orsamus H. Marshall Relating to the Early History of the West' (1887).

MARSHALL, Thomas Riley, American lawyer and politician: b. North Manchester, Ind., 14 March 1854. He was graduated from Wabash College in 1873 receiving the degree of A.B., and was admitted to the Indiana bar in 1875, practising his profession at Columbia City. In 1908 he was elected governor of Indiana. His administration was progressive, and several laws were sponsored by him, including an employers' liability law, an anti-gambling law and direct nomination of senators. In 1912 he was chosen by the Democratic National Convention at Baltimore as the candidate of the Democratic party for Vice-President of the United States. He was a consistent supporter of the Wilson administration and in 1916 was again nominated and elected Vice-President. Some of his public utterances in 1913, in which he appeared to advocate radical ideas in regard to the inheritance of property, caused much criticism. Wabash, Pennsylvania and Notre Dame universities conferred on him the degree of LL.D.

MARSHALL, William Louis, American soldier: b. Washington, Ky., 11 June 1846. He was educated at Kenyon College in 1859–61; served in the Union army in 1862–63 and in 1868 was graduated at the United States Military Academy. He was promoted through the various grades, reaching that of brigadier-general, chief of engineers of the United States army, 2 July 1908. In 1870–71 he was acting assistant professor of natural and experimental philosophy at West Point and from 1872 to 1876 had charge of the Colorado section of the explorations west of the 100th meridian. He discovered Marshall Pass over the Rockies in 1873, also gold placers of Marshall Basin, San Miguel River, Colo., in 1875. In 1881–84 he was in charge of the construction of levees in Mississippi, Louisiana and Arkansas, and improvement of the Mississippi River, of harbors on Lake Michigan in 1884–1900. He also superintended the construction of the Hennepin Canal 1890–1900 and subsequently was engineer in charge of the construction of fortifications at eastern and western entrances to New York harbor. He constructed the 40-foot Ambrose Channel entrance to New York harbor. As chief of engineers he had charge of river, harbor and fortification works of the United States from 1908 to 1910. In 1914–15 he had charge of the protection of the Imperial Valley, Cal., against the overflow of the Colorado River. General Marshall has invented automatic movable dams, lock gates and valves for canals.

MARSHALL, Ill., city and county-seat of Clark County, on the Vandalia Line and the Cleveland, Cincinnati, Chicago and Saint Louis railroads, 50 miles south of Danville and 17 miles west by south of Terre Haute, Ind. It is in an agricultural and stock-raising region. Pop. 2,569.

MARSHALL, Mich., city and county-seat of Calhoun County, on the Kalamazoo River and on the Michigan Central railroads, about 38 miles southwest of Lansing and 100 miles west of Detroit. The surrounding country is devoted chiefly to agriculture. The principal industries are railway shops, school and church furniture, hot-air furnaces, patent medicines and foods and stove works. The marble and granite works employ a number of men. There are municipal waterworks and a lighting plant. The grounds of the County Agricultural Society are located in Marshall. There are two daily newspapers. Pop. 4,236.

MARSHALL, Minn., city and county-seat of Lyon County on the Redwood River and on the Chicago and North Western and the Great Northern railroads, about 150 miles west by south of Saint Paul. It is in an agricultural section in which wheat is the principal product. The industrial establishments are a flour mill, grain elevators, sash and door factory and a creamery. Municipally owned electric light and water works are established. Pop. 2,800.

MARSHALL, Mo., city and county-seat of Saline County, on the Missouri Pacific and the Chicago and Alton railroads, about 80 miles east of Kansas City and 40 miles west of Shreveport, La. It was settled in 1839 by people from Virginia and Kentucky, and was incorporated as a city in 1866. It is situated in an agricultural region; in the vicinity are valuable deposits of coal and salt, and nearby are stone quarries. The manufactures are lumber, tile and brick, flour, canned goods, creamery products, wagons and carriages. It is the seat of the State Institution for Feeble-Minded and Epileptics, the Missouri Valley College (Cumberland Presbyterian), established in 1889, San Saviour Academy (Roman Catholic). There are eight churches and public and parish schools, a Carnegie library and an opera-house. Marshall has four banks with a combined capital of $300,000. The government is of commission form. It has a daily newspaper and good banking facilities. Pop. 4,869.

MARSHALL, Tex., county-seat of Harrison County, is situated about 14 miles north of Sabine River, 40 miles west of Shreveport and 67 miles south of Texarkana. The city was founded in the year 1840. Marshall is situated in the midst of a fertile agricultural region which has heretofore engaged mostly in cotton raising, but recent developments show that this section is well adapted to truck growing and the raising of fruits, especially peaches, and large orchards are being planted. The city is largely supported also by lumber interests, there being large areas of pine timber contiguous to the city, which is rapidly being marketed. The land from which the timber is taken is quickly occupied for agricultural and orchard purposes, some orchards containing as high as 6,000 acres. Stock raising is also carried on and the city receives considerable support from this source. The Texas and Pacific Railroad runs through the city, west to El Paso, north to Texarkana and southeast to Shreveport and New Orleans. The Texas Southern Railroad has its terminus at present at Marshall, but will be pushed farther south. The shops of the Texas and Pacific Railroad, located at Marshall, are the finest

to be found anywhere in the Southwest. Locomotives and all kinds of rolling-stock are manufactured. These shops have a local payroll of $50,000 a month. The local shops and general offices of the Texas Southern Railroad are also located in Marshall. Marshall has also a 50-ton cotton-seed-oil mill; the Marshall car-wheel and foundry plant, employing 325 men; two wagon factories, a soda-water apparatus factory — 22 factories in all, giving employment to 1,200 people, using a capital of $1,700,000 and producing annually $1,800,000 worth of goods. The city has installed complete sewerage and waterworks plants.

There are excellent churches and schools. The total value of the city school property is $100,000. There are, also, a number of private schools. There are three Catholic schools in the city — one for girls and one for boys, and an industrial school for boys. In the city are also located the Wiley University and Bishop College, institutions for the education of the negroes; the former with 493, and the latter with 500 students annually. The property of the former is valued at $65,000 and the latter at $150,000.

The city has two national banks with a total capital of $200,000, a daily, semi-weekly and weekly newspapers. Marshall and vicinity is noted for the medicinal properties of its many springs and wells, and many people annually, especially during the summer season, visit these places as health resorts. Pop. 13,000.

MARSHALL, College of, Marshall, Tex., The College of Marshall was chartered 22 Oct. 1912 by some citizens of the city of Marshall, whose purpose was to maintain an institution of Christian learning of collegiate grade. There should be 16 trustees, at least 10 of whom should be members of regular Baptist churches. This charter was amended on 14 Nov. 1916, whereby the control and management of the college was transferred to the Baptist General Convention of Texas. It was proposed not to open the institution until an administration building and suitable dormitories could be built. On 4 June 1917 the college opened with a summer session and summer normal. The enrolment before the end of the first year was 553. The College of Marshall meets a long-felt need in East Texas and sections of Oklahoma, Arkansas and Louisiana. There is no educational institution of collegiate grade in a distance of some 200 miles. It already has the most costly plant between Dallas and New Orleans. Its buildings consist of one three-story and basement fireproof administration building, two three-story brick dormitories, a dining-hall, central heating plant and a magnificent campus of 55 acres. The whole plant is worth $300,000. The quota for the student's army training corps was 150 men. After demobilization of the students' army training corps an officers' reserve camp was installed. The institution is coeducational.

MARSHALL ISLANDS, Polynesia, an archipelago in the western Pacific Ocean, belonging to Germany from 1885 until she lost her colonies in the World War, when the Japanese took control. They are situated eastward of the Carolines and northward of the Gilbert Islands, and lie between 5° and 12° N. lat. and 165° and 171° W. long. The group consists of two parallel chains, the Ratak group of 15 islands in the east and the Ralik group of 18 islands in the west; total area, 154 square miles. The islands rise nowhere more than 10 feet above the sea and are not very fertile, the chief vegetable productions being the cocoanut palm, the breadfruit and the pandanus. The natives are Micronesians. They are skilful in weaving mats and in the construction of large canoes. Copra is the only commercial product. Pop. about 16,000, including, in 1913, 179 Europeans.

MARSHALLTOWN, Iowa, city and county-seat of Marshall County, on the main lines of the Chicago and North Western and Chicago, Great Western and Minneapolis and Saint Louis railroads, 68 miles northeast of Des Moines. It was settled in 1859, incorporated in 1863 and received a charter as a city of the second class in 1868. It is located in the heart of a rich agricultural and stock-raising district, in which corn and hogs are the chief farm products. The industrial plants include Minneapolis and Saint Louis shops, packers of grocers' sundries, meat-packing, furnaces, heating specialties, foundry and machine shops, bottling works, agricultural implements, as well as large independent oil jobbing. The Iowa State Soldiers' Home, covering 160 acres of ground, is located here. The city is governed on the commission plan. It operates its own waterworks and electric-light plant. Pop. 16,065.

MARSHALSEA, mär'shal-sē, a jail in London, attached to the Marshalsea Court, originally established under the earl-marshal of England for the trial of servants of the royal household. Later it was used as a prison for debtors and defaulters, as well as persons convicted of piracy on the high seas. It stood near the church of Saint George, Southwark, and existed in the reign of Edward III. It was abolished in 1849. The Marshalsea will be longest remembered as the home of 'Little Dorrit.' Dickens' father was for some time an inmate of the Marshalsea, and in 'Little Dorrit' the novelist has given us a vivid picture of the life of a debtor and his family in this prison.

MARSHBUNKER, MARSBUNKER, Etc. See MOSSBUNKER.

MARSHFIELD, Ore., town in Coos County, on Coos Bay and on the Coos Bay, Roseburg and Eastern Railroad, 10 miles north of Coquille. It contains a Carnegie library, coal mines, lumber yards, pulp and paper mills, veneered wood works, sash and door factories, etc. The harbor has a channel 300 feet wide with a depth of 25 feet. The vessels of the Inter-Ocean Transportation Company, the Northern Pacific Steamship Company and the Southern Pacific Steamship Company call at Marshfield. Pop. 5,780.

MARSHFIELD, Wis., city of Wood County, on the Chicago, Saint Paul and Milwaukee and the Chicago and North Western railroads, almost in the centre of the State, about 160 miles northwest of Milwaukee. It was settled in 1871 by Louis Rivers and was incorporated as a village in 1875, and chartered as a city in 1883. It is situated in an agricultural region and near extensive forests. The industries of the city are chiefly connected with manufacturing and farming. The chief industrial establishments are a furniture factory which employs

300 persons; veneer factory, 125; bed and mattress factory, 40; lumber-mills, 50; brick yards, 25; cooperage and excelsior factory, 40; other establishments employing about 30 persons. The city has a fine city-hall, a public library, seven churches, four newspapers, a high school, four public and two parish schools. The two banks have a combined capital of $800,000. The government is vested in a mayor and 12 aldermen, who are elected every two years. About two-thirds of the inhabitants are of German descent. Pop. 5,783.

MARSHMAN, Joshua, English Baptist missionary and Orientalist: b. Westbury, Leigh, Wiltshire, 20 April 1768; d. Serampore, India, 5 Dec. 1837. He was, like his father, a weaver, but had an insatiable thirst for learning and always kept a book on his loom. Thus he fitted himself to teach in a Baptist school in Bristol; and thence, in 1799, he went to Serampore as a Baptist missionary, and there founded, in 1810, a missionary college. He was an able linguist, and published 'The Works of Confucius, containing the Original Text' (1809); 'Clavis Sinica' (1814); a Chinese version of the Bible, etc. He co-operated with Carey in the preparation of Telegu version of the Bible, a Bengali-English dictionary and a Sanskrit grammar. Consult Carey, 'Marshman and Ward' (1864).

MARSILEACEÆ, a natural order of acotyledonous plants, nearly allied to Lycopodiaceæ, but differing in the lack of a stem, and in the usually stalked leaves. The species all are inhabitants of ditches and pools, chiefly in temperate regions. No species was known to be of any importance till the discovery of the Nardoo of Australia.

MARS-LA-TOUR, France, village in the department of Meurthe-et-Moselle, 15 miles west-southwest of Metz, on the road to Verdun. In the Franco-Prussian War of 1870–71 it was the scene of part of the battle of Gravelotte. The 38th German brigade was annihilated here.

MARSTON MOOR, England, in Yorkshire, is celebrated for the defeat there in 1644 of the royal forces numbering about 18,000 under Prince Rupert by the Parliamentary troops and Scots, totaling about 27,000 under Fairfax (Earl of Manchester) and Cromwell. Rupert escaped with only 6,000 followers into Lancashire and later rejoined King Charles. As a result, the whole north of England was left to the Parliamentary troops. Consult Kennedy, J. W., 'Scottish Borderers at Marston Moor, 1644' (1902).

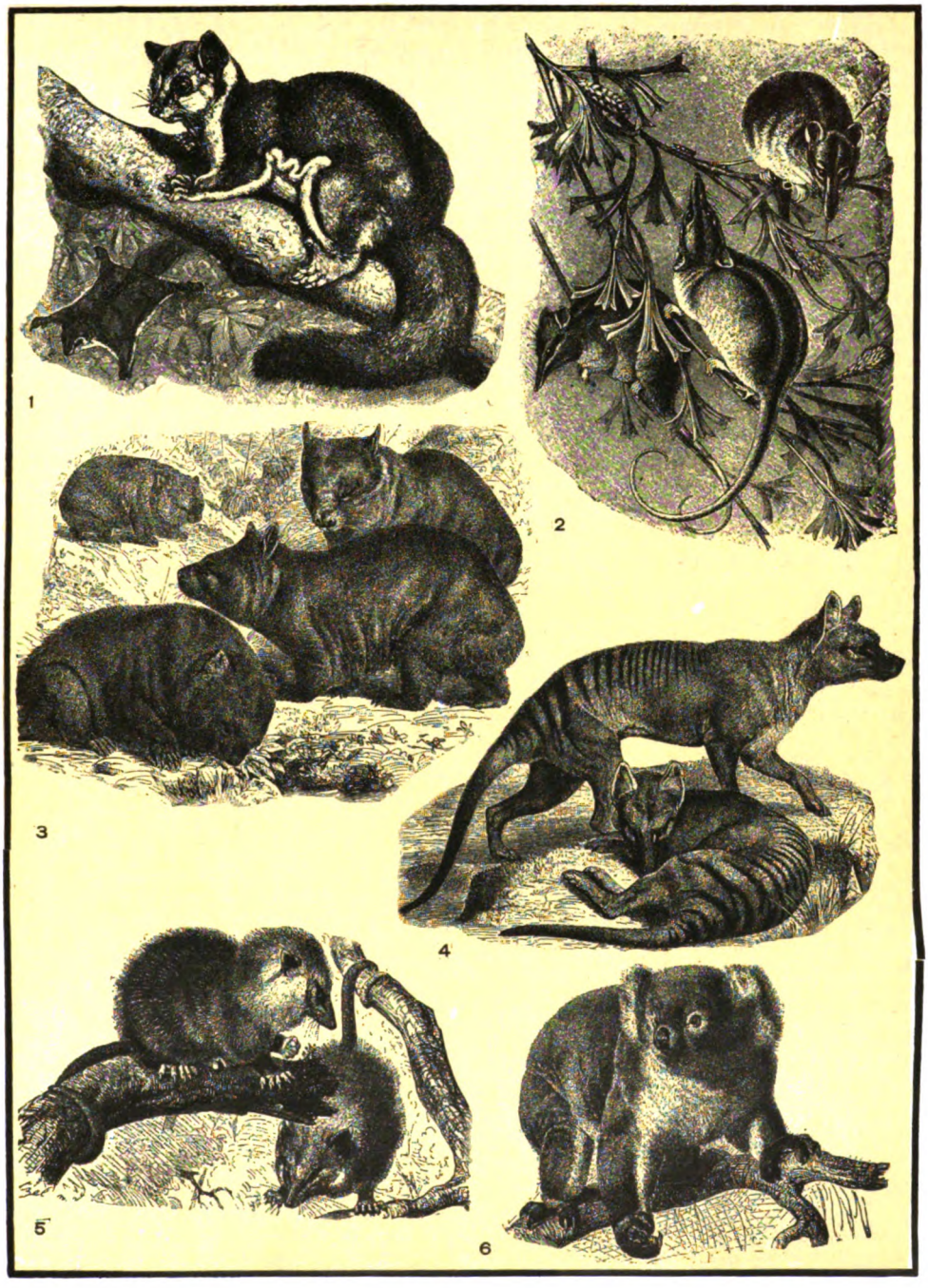
MARSUPIAL FROG, any of several small tree frogs (*Hylidæ*) of the South American genus *Nototrema,* which incubate their eggs in brood-pouches formed by infoldings of the skin on the back of the female. The eggs are few, of large size and abundantly provided with food-yolk, and the young sometimes remain in the pouches after hatching until they have completed their metamorphosis and attained considerable growth; but the species vary in this respect. In one case the opening is a longitudinal slit along the middle of the back, with a brood-pouch on each side; but in the other species the double pouch opens cross-ways, near the caudal extremity of the body and may be closed by a sphincter muscle. About half a dozen species are catalogued, all natives of the forests of tropical America, and none is common or thoroughly well known. Gadow ('Amphibia and Reptiles,' 1901) concedes that the best account of them is still that of Weinland in 'Archive für Anatomie und Physiologie' for 1854.

MARSUPIAL MOLE, a small burrowing marsupial of southern Australia (*Notoryctes typhlops*), called "urquamata" by the natives, which has a remarkable similarity to a true mole in appearance (except its reddish color), adaptations of structure to an underground life and habits. It feeds upon ants and other insects and often emerges and travels above ground, though the front feet have been so transformed into digging organs as to make them of little service for walking. It represents a family (*Notoryctidæ*) first described by Stirling in the 'Transactions' of the Royal Society of South Australia for 1891.

MARSUPIALIA, the marsupial mammals, a group ranked as an order, yet embracing the whole of the superior group *Metatheria* or *Didelphia,* as it has been variously named. The latest investigations, however, tend to invalidate the distinctions upon which these groups were formerly sharply separated from the higher mammals and to cause the marsupials to be regarded only as an order of *Eutheria* (q.v.), now distinguished chiefly by their extremely local distribution and degenerate non-placental type of reproduction. Their origin was extremely ancient and its sources are not known; but the group appears to have risen to Mesozoic times among the earliest of mammalian forms and to have begun, even before the advent of the Tertiary period, a course of special modification and degeneration, especially in the line which has survived to the present. The former belief that the marsupials stood in the direct line of ancestry of mammals generally, which were thus considered as modified and diversified offshoots from the stock, is no longer held; on the contrary, the marsupials are regarded as a branch from some very early generalized stock, if not a group of independent origin. It is noteworthy, according to Woodward ('Vertebrate Palæontology,' 1898), that the earliest known complete mammalian skeletons, which pass upward by insensible gradations into undoubted *Eutheria,* are scarcely distinguishable from the skeletons of the more generalized existing marsupials (for example, *Thylacinus*). In the later Mesozoic Age the marsupials were apparently scattered over all the land-area of that time, as their remains have been discovered in many parts of both hemispheres; but even previous to the Eocene epoch they had disappeared entirely from north of the equator. From the first they are divisible into the two branches or suborders of *Polyprotodontia* and *Diprotodontia.* The former, characterized by numerous small incisor teeth, includes a majority of the most ancient forms and such modern groups as the opossums and desyures; while the latter, characterized by only abo six upper incisors and two, much enlarged, lower incisors, contain, besides some ancient forms, the majority of modern representations of the order, as the kangaroos, phalangers, wombats, etc.

The marsupials take their name from the ventral pouch of skin, covering the mammary glands, in which the young are nourished or

MARSUPIALS



1 Sugar Squirrel (Belideus sciurues)
2 Mouse-phalanger (Tarsipes rostratus)
3 Wombats (Phascolomys wombat)
4 Tasmanian Wolf (Thylacinus cynocephalus)
5 American Opossum (Didelphys virginiana)
6 Koala (Phascolarctos cinereus)

protected in most families, and which is indicative of the peculiar method of reproduction characteristic of the order, and for the support of which two bones (the epipubic bones), not present in higher mammals, project forward from the pelvis. The internal organs of reproduction are double, the two oviducts not uniting into a single uterus or vagina, although the separation of the two parts is often imperfect; hence the term *Didelphia* (q.v.). The testes of the male are suspended in a scrotum in front of the penis, the *glans* of which is often double. As a rule no allantoic placenta is present, but there is reason to suppose that the primitive marsupials were placental, and rudiments of this structure persist in the existing Australian bandicoots — a fact which invalidates the former prime distinction made between the marsupials and higher *Eutheria*.

The young are dropped from the mother's womb as minute, undeveloped fœtuses, those of the largest kangaroos being not half as large as mice when born. These larvæ (for they are that) are then taken by the lips of the mother and placed, one by one, within her ventral pouch, where each is attached to one of her teats, where it clings by means of its temporary sucking-mouth and is nourished by the milk which oozes or is pressed down its throat. They remain there a length of time varying with the size of the species, until they have grown to an advanced stage of development, when they gradually emerge; but for a long time afterward return to the mother's pouch for refreshment, rest or safety when alarmed. The pouch varies in its capacity and completeness, in some families being quite absent, so that the young are shielded only by the long hair upon the mother's belly.

While this strange method of reproduction is the most prominent peculiarity of the marsupials, they differ from other orders of mammals in several anatomical features, such as the simplicity of the brain, in which the cerebellum is completely exposed, and the tendency to separation of bones of the skeleton, usually solidly anchylosed in other mammals.

Since early Tertiary times marsupials have been confined to South America and the Australasian region, with the single exception of the few North American opossum (q.v.). This family (*Didelphyidæ*) is restricted to the western hemisphere and alone remains of the large number of Tertiary forms once prevalent in South America, save a single Patagonian diprotodont, the opossum-rat (q.v.). The home of the group, then, is Australia, Tasmania and the Papuan group, where about 125 species are known; and the race seems to have survived in that insular region owing to the absence of destructive enemies, for most of them are almost defenseless vegetable feeders. They have, however, developed into a great variety of forms under the influence of varying conditions and long competitions, and present a most curious parallel to the diversities observable among the higher and more widely diffused mammalia. Some have large size, go in herds and occupy grassy plains; others are smaller, more agile and confined to mountainous districts. Others are still smaller, burrow and feed upon roots or resemble little terrestrial rodents in appearance and habits; while many forms dwell altogether in trees and often simulate squirrels of various kinds. In another direction have been evolved a variety of predatory marsupials, whose needs have developed bodies, teeth and powers resembling those of wolves or bears, and which are wholly flesh-eaters. There is, in fact, hardly a group of mammals which does not find a counterpart among the marsupials,— even the moles and shrews.

The classification of the order divides it into 10 or 12 well-defined families, some of which are wholly extinct, as follows:

POLYPROTODONTIA:

Doubtful primitive forms,—*Triconodon*, Amphitherium, etc.

Didelphyidæ.— Opossum (q.v.).

Dasyuridæ.— Dasyures, Thylacines, etc. (qq.v.).

Peramelidæ.— Bandicoots (q.v.).

Notoryctidæ.— Marsupial mole (q.v.).

DIPROTODONTIA:

Epanorthidæ; Abderitidæ, etc.— Fossil in the Miocene strata of Patagonia; but surviving in *Cænolestes*.

Phalangeridæ.— Phalangers (q.v.).

Diprotodontidæ.— Extinct gigantic phalangers.

Phascolomyidæ.— Wombats (q.v.).

Macropodidæ.— Kangaroos (q.v.).

Consult Beddard, 'Mammalia' (1901); Thomas, 'British Museum Catalogue of Marsupialia,' etc. (1888); Gould, 'Mammals of Australia' (1863); and scientific works on Australia, especially those of Waterhouse, Aflalo and Lydekker.

MARSYAS, mär'sĭ-ăs, mythological son of Hyagnis and one of the Sileni of Asia Minor. Athena, having seen the reflection of herself in water, had thrown away the flute which she had invented, displeased because it disfigured the countenance in playing, and had pronounced the severest maledictions against any one who should take it up. Marsyas accidentally found this instrument, on which he soon acquired such skill that he dared to challenge Apollo to a contest, the conditions of which were that the victor should do what he pleased with the vanquished. The Muses, or according to others the Nysæans, were invited to be the umpires. The Muses decided in favor of Apollo, who put to death his rash competitor by binding him to a tree and flaying him alive. In this way was the curse of Athena accomplished. Marsyas' statue was erected in several Roman cities as a symbol of liberty and other statues have been found illustrating his experiences, one by Praxiteles, which has been preserved in the Athens Museum.

MART, Tex., city in McLennan County, situated on the International and Great Northern Railroad, 20 miles east of Waco. The surrounding region is devoted to cotton-growing in which the city has extensive interests. It contains cotton gins, compresses and cotton-seed-oil mills, railroad repair shops and a high school. The commission form of government is in operation. The water supply system is owned by the municipality. Pop. 2,939.

MARTA OF THE LOWLANDS (Terra baixa), the foremost achievement of the Catalan theatre, was written in Catalan by Angel Guimerá for Fernando Díaz de Mendoza and

María Guerrero and performed for the first time by these actors in the Spanish translation by José Echegaray. It is the first Catalan work to obtain general currency beyond the limit of the provincial tongue. During the present century no play has been more popular in the Spanish or Hispano-American countries, where it has maintained itself upon the stage without interruption since 1896, enlisting the talents of all the leading actors. 'Terra baixa' is predominantly social and human in appeal. This is its fundamental quality; but in equal degree it possesses high theatric effectiveness, which is not inferior to the best work of its period in this vein, whether produced in Spain or elsewhere. Simple feeling and torrential passion, in conjunction with sensitive insight and unusual grasp of significant situation, convey an impression of elemental forces operating behind the broad effects of a carefully elaborated theatrical art, happily employed strictly in subservience to the theme. More than any other play, 'Terra baixa' has contributed to fix the general conception of Iberian peasant drama which prevails in Europe and America. A certain idealization may be noted in the rural characters, a reminiscence of the author's apprenticeship in the poetic drama. In objective realistic detail Guimerá is an unequivocal master. 'Terra baixa' has been translated into more than 20 languages. The English version by Wallace Gillpatrick (New York 1914) was acted successfully in England and the United States previous to publication. As 'Tiefland,' the play is favorably known in operatic form, with music by Eugène d'Albert.

JOHN GARRETT UNDERHILL.

MARTEL, Charles. See CHARLES MARTEL.

MARTEL DE JANVILLE, Gabrielle, COMTESSE DE ("Gyp"), French author: b. Coëtsal, Morbihan, 1850. She is a great grandniece of Mirabeau and at the age of 19 was married to Comte Martel de Janville. Her writings deal with types of Parisian life, of which Petit Bob, Loulou and Paulette have become famous. Over 135 volumes in all have issued from her pen. These include 'Petit Bob' (1882); 'Autour du mariage' (1883); 'Un homme délicat' (1884); 'Elle et lui' (1885); 'Autour du divorce' (1886); 'Pour ne pas l'être?' (1887); 'Pauvres petit femmes' (1888); 'Bob au salon' (1888); 'Mademoiselle Eve' (1889); 'Bob à l'Exposition' (1889); 'L'Education d'un prince' (1890); 'Monsieur Fred' (1891); 'Mariage civil' (1892); 'Du haut en bas' (1893); 'Mariage de chiffon' (1894); 'Le cœur d'Ariane' (1895); 'Le bonheur de Ginette' (1896); 'Totote' (1897); 'Israël' (1898); 'L'Entrevue' (1899); 'La pays des champs' (1900); 'Le friquet' (1901); 'Sœurette' (1902; 2d ed., 1910); 'Un ménage dernier cri' (1903); 'Maman' (1904; 2d ed., 1910); 'Le cœur de Pierrette' (1905); 'Ces bons Normands' (1907); 'La paix des champs' (1908); 'Joies d'amour' (1909); 'L'Amoureux de Line' (1910); 'La guingette' (1911); 'Le grand coup' (1912); 'Napoléonnette' (21st ed., 1913).

MARTELLO TOWERS, so called by corruption from *Mortella*, in Corsica, where a strong tower maintained a determined resistance to a superior English force in 1794. In consequence of the great strength exhibited by this fort the British government erected a number of similar towers round the coast of Great Britain, and especially on the Kentish coast, as a defense against the threatened invasion from France. They are circular, with walls of great thickness, and roofs bomb-proof, there are two stories, the lower for the reception of stores and the upper for the casement of troops. One traversing gun was mounted upon each, in working which the men were secured by the lofty parapet. The ordinary guard was from 6 to 12 men. With improved modern artillery Martello towers are useless, and in many places were dismantled, but some have received a new and more powerful armament, or have been adapted to the use of the coast guard, or revenue officers. In some instances they are rented to private individuals. Martello towers are still to be found in New Brunswick and Nova Scotia. There are also several on the Gulf of Mexico and one still remains at Kingston, Canada.

MARTEN, the name of several fur-bearing animals of the weasel family (*Mustelidæ*) that are mainly arboreal in habits, and do not change their color to white in winter. All inhabit the cooler parts of the Northern Hemisphere. The beech or stone marten (*Mustela foina*) is to be found in Europe generally south of the Baltic, although not now a native of Britain. It is about 17 inches long in body, and its tail adds nine inches; its breast is white. It is tractable, and is believed by some to be the animal domesticated by the ancient Greeks as a mouser. The pine, or sweet, marten (*M. martes*) is rather smaller, but with a much longer tail, proportionally, and is more northerly in its distribution, occurring from the British Isles and Norway eastward to Siberia. It has a finer, more valuable fur than the other, and a yellow throat. Very nearly allied to it in size, form and color is the Siberian sable-marten (*M. zibellina*), noted as furnishing in its coat the finest and most expensive of the furs from animals of this group. The demand for this fur can be met only by the most difficult, and often dangerous, exertion in trapping and hunting in remote Asiatic forests; and it has resulted in a steady diminution of the supply and very high prices for the pelts. There is also a native marten in India and another in Japan. North America has two species of the genus — the American pine-marten, or Canadian sable (*M. americana*), and the pekan (*M. pennanti*). The former is hardly distinguishable from the sable of the Old World, and its fur, although regarded as somewhat inferior, is largely used as a substitute for genuine Siberian sable. (See FUR-TRADE). The pekan is very distinct by its greater size (length, 24 inches, plus tail, 13 inches), its long and very dark coat and its dog-like head. Its fur is of great value.

The body in all these martens is elongated and supple, with a long and somewhat bushy tail; the legs short and the toes separate and flexible, with long sharp claws adapted to the life in trees that most of them follow. They are fierce and cunning hunters, pouncing successfully on all sorts of small animals and birds, destroying birds' nets, catching frogs, and in winter pursuing and killing animals as large as hares and porcupines. The pekan, or fisher, is especially bold and voracious, but does not eat fishes in spite of its name. Both the

American species were formerly common in the mountainous parts of the eastern United States, but are now restricted to the remoter woods of Canada. They make their dens, bedded with leaves and grass, in some high hollow of a tree-trunk, as a rule, but frequently choose a crevice among rocks, and there produce annually a litter of from one to seven young. The period of gestation is about three months, and the young begin to leave the nest when two months old.

Breeding for Fur.— These bloodthirsty little carnivores are the very type of savagery, and even the kittens are almost untamable. The high value of their fur (about 75,000 pelts of the sable, and 100,000 of the Canadian marten represented the market-supply just before the Great War) has caused much effort to be expended, especially in Canada, to breed them in confinement, but thus far the results have been small, although encouraging. The general treatment and food seem to be like that for minks. A large pen made of inch-mesh wire and floored with this, or in some way so prepared that the animal cannot dig out, should contain stumps and bushes to give the marten accustomed exercise. Two males cannot be put together. When the female is ready for a mate she is placed in his cage, or vice-versa, and the mating will take place at night, so that the pair must usually be left together several days. Mating occurs naturally in January or February. When the young are about two months old they may be removed from the mother, and should be brought up by hand, if possible, so as to become more gentle. These general directions apply to the pekan, but his quarters should be larger than for the sable.

Consult, besides general natural histories, Coues, 'Fur-bearing Animals' (Washington 1877); Ingersoll, 'Life of Mammals' (New York 1909); Seton, 'Northern Mammals' (New York 1909); Jones, 'Fur-Farming in Canada' (Montreal 1913).

MARTENSITE, a constituent of steel, existing at a high temperature, and which being retained by sudden cooling, confers hardness upon the steel.

MARTHA'S VINEYARD, Mass., an island off the southern coast, in the county of Dukes, about 25 miles southeast of New Bedford. It is separated from the mainland by Nantucket and Vineyard sounds, from Nantucket Island by Hukeget Channel, and from Elizabeth Islands by Vineyard Sound. It is about 21 miles long and 10 miles across the widest part. The northern coast is high and rocky, Prospect Peak being 308 feet; the coast line has few indentations, the largest of which is Vineyard Haven. The southern coast is low and irregular, with sand bars and shallow lagoons. On the southwest is Gay Head, 200 feet above the water. A lighthouse is on Gay Head Point. Edgartown, the county-seat, is the principal town on the island. Bartholomew Gosnold discovered and named the island in 1602. The Indians, who then occupied the place, were quiet and friendly, and all became Christians. They remained loyal to the whites even during King Philip's War. The island is a favorite summer resort; annual camp-meetings and summer schools have been held here for a number of years. Pop. of county 4,504.

MARTI, José Julián, ho-sā' hoo-lē-än' mär'tē, Cuban author and patriot: b. Havana, 28 Jan. 1853; d. Dos Rios, Cuba, 19 May 1895. He studied in Havana, was sent to the quarries while only a boy as a political suspect, then went to Spain, where in Madrid and Saragossa he studied for the bar and made himself famous for his liberal views, and on his return to America was professor in the University of Guatemala, whence he came to New York City as consul for Uruguay, Paraguay and Argentina. In 1894 he attempted to land armed men in Cuba, but was intercepted in Florida; in the next year he succeeded in landing, joined Gomez and was killed in a skirmish with the Spanish at Dos Rios. Marti founded the Cuban organ of independence in New York City, *La Patria*. He was a poet, and wrote a Spanish translation of Helen Hunt Jackson's 'Ramona' (1888).

MARTIAL, mär'chĭ-ąl (MARCUS VALERIUS MARTIALIS), the world's greatest early writer of epigrammatic poetry, was born in Bilbilis, Spain, 1 March of one of the years 39 to 41 A.D., and died probably between 102 and 104 A.D. Like his literary friends, the Senecas, Lucan and Quintilian, who also were of Spanish birth, Martial in his writings was thoroughly Roman, and indeed has left us our most valuable picture of contemporary Rome. A Fronto and Flacilla, whom he mentions, may have been his parents, but we know nothing of their origin or station. The grammatical and rhetorical training which his parents secured for him perhaps at Tarraco or Corduba, he half-seriously disparaged as being of no financial advantage, but it was really to his pen that he owed, at least indirectly, his support through life. For, although he was apparently fully equipped for practice at the bar, the profession of an advocate was too exacting to be attractive. On his arrival in Rome, perhaps in 64 A.D., powerful friends launched him on a literary career which rapidly carried his fame even to the limits of the empire. But success as a poet brought him no contentment, since in return for the money, food, clothing, etc., which by flattery and begging he got from imperial courtiers and other men and women of wealth, he had daily to perform social duties that were highly irksome to his indolent nature. From the patron's reception at dawn to the end of the latest dinner, he had to dance attendance with wit that should never fail. We find him living at first in humble lodgings on the Quirinal, later in a house of his own on the same hill. A barren farm near Nomentum was his usual refuge from the cares and noises of the capital, but he sometimes made long journeys in Italy, often visiting the country houses of his friends. To his poetical and social talents he also owed political favors from Titus and Domitian. A tribuneship gave him membership in the equestrian order, but probably not the fortune of a knight. He likewise received the coveted privileges to which a father of three children was entitled, the *ius trium liberorum*, though unearned; for the references that have given rise to the theories that he was married from one to three times are not of personal application. It is probable that even Marcella was no more than his patroness. When disgust at the client's life in Rome led him in 98 to return to Bilbilis, this Spanish lady gave him a fine estate. A longing soon seized

him, however, to be back in Rome with all its inspirations, a longing never to be gratified; Pliny the Younger, who had helped Martial with a gift of money on his departure from Rome, records the poet's death in Spain. Besides those already named, Juvenal and Silius Italicus should be mentioned as Martial's friends. Noteworthy among contemporaries whose names do not appear in his poems are Tacitus and Statius. The former could have had little sympathy with his character, the latter was no doubt his rival in literary mendicancy. We have 1,575 of Martial's poems. More than half of these are of four lines or less. His earliest book published in 80 contains epigrams describing shows given by the emperor. Then followed books XIII and XIV made up of two-line inscriptions for presents at the Saturnalia. The other books (I–XII), containing many poems which we should not call epigrams at all, appeared at varying intervals in the period 85–101. Martial's influence in his chosen field has never ceased. A remarkable number of the best epigrams in modern languages are merely adaptations or translations of his poems. His personal character has received general condemnation. Obscenity and servile flattery are the main charges. But in judging even the insincere language that he uses in speaking of the tyrant Domitian we must remember that it went only a step beyond the requirements of formal court etiquette. Kindly critics find in Martial some good points, his modest valuation of his own work, his freedom from envy, his scorn of all hypocrisy, his steady resistance to all temptations to use his powerful weapon of satire in either an unjust or unkind spirit, his tender love of children, humane treatment of slaves and above all his deeply affectionate attachment to his friends. See EPIGRAM.

Bibliography.— The best text edition of his poems is that of W. M. Lindsay, Oxford, Clarendon Press. The German annotated edition of Friedlaender is invaluable. The only complete translation in English, is in the Bohn series.

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MARTIAL LAW, government by arbitrary military power; that supersedes municipal law, or State law, yet is not a military law. When in time of extreme peril to the State, either from without or from within, the general safety cannot be trusted to the ordinary administration, or the public welfare demands the adoption and execution of extraordinary measures, it may become necessary to declare the existence of martial law. This is, indeed, no law at all in its ordinary sense; it is in fact the abrogation of it. That which is done under martial law has not an immediate constitutional or legislative sanction, as the military or the statute law, for example, has. Yet remotely and indirectly martial law expresses the will of the people. The Supreme Court of the United States has held that a State legislature may proclaim its existence whenever the public safety demands it; and the Constitution, by implication at least, also permits its proclamation by that clause which provides that the privileges of the writ of *habeas corpus* shall not be suspended, unless when, in cases of rebellion or invasion, their suspension is essential to the general welfare. See also LAW, MILITARY; MILITARY COURTS AND COURT-MARTIAL.

MARTIAL'S EPIGRAMS. Marcus Valerius Martialis, the epigrammatist, was born about 40 A.D. in Bilbilis, Spain, 20 miles west of the present Aragonese city of Saragossa. He went to Rome at the age of 23, and after nearly two score years of residence at the capital returned to his native town, where he died about 104. At the age of 40 he celebrated the dedication of the Coliseum and won the favor of the Emperor Titus by composing the 'Book of Spectacles,' a collection of epigrams on the incidents of the day's sport. Several years later he published two collections of couplets to be used with dinner favors and with presents at the Saturnalia, which afterward took their places in his works as books XIII and XIV. Books I to XII, his really characteristic work, were published at intervals more or less regular from 86 to 102, the last one having been sent from Spain after his return. The total number of pieces in the 15 books is about 1,550, of which three-fourths are in the elegiac couplet, like the verse of Ovid and the great part of Greek epigram.

Though at first glance Martial seems to continue the tradition of the epigram, which had already had long life and great fame in the Greek tongue, he is really to a large extent original and creative, and is of the greatest importance in literary history as being the founder of the epigram as it has been popularly conceived ever since; that is, as a short, highly concentrated poem with a point that is made to appear suddenly or with a surprise.

> "Chloë weeps with one eye. Do you ask how it's done?
> The answer is easy: she has only one."
> (Dimsdale.)

Whether his influence has been the best is sometimes questioned. Those who are familiar with the calm, sunny, contemplative, tripping genius of the Greek Anthology, which, though its epigrams are always neat and concise, and sometimes stinging, has not as a whole the satiric character, will be likely to think Martial somewhat hard and metallic in both form and content. Those who enjoy "verbal exactness and mechanical ingenuity" (Dimsdale), and look to the epigram for the character of stinging, satiric pointedness usually associated with it, will agree with Lessing that he is the world's greatest epigrammatist, and understand his appeal to Dryden, Pope and Johnson.

Martial is not all pungency. A not inconsiderable number of his pieces are epigrammatic rather than epigrams; a few of them might be classed as short poems without reference to epigram. They are nevertheless homogeneous. Even more than perfection of form, the characteristic that gives them all a unity, is their quality as a human document. Martial was right when he said, "My page smacks of human life." Provincially and simply bred, pursuing the existence of a free lance in a great capital in an intense age, gifted with a keen understanding, a quick eye, and a responsive pen, he converted into clear, cameo-like literary pictures for the amusement of his own time, and for the amusement and instruction of all time, innumerable vivid impressions from the fascinating realities among which he moved. To read his epigrams in quantity is like sitting before a cinematograph of the Flavian era. There flash before us lively scenes

of men and things: numerous faces of the known and the nameless, types of men and women from every sphere, the bawling schoolmaster with his noisy pupils, the poetical bore reciting his verses to unwilling ears, the stingy host, the snowstorm in the amphitheatre, the routine of the Roman day, the patron who is never at home, the guest who comes too early, the transparent hypocrite, the slow barber, the waste slopes of recently active Vesuvius, the incident of the circus or theatre or the dinner or the street. In an age of *ennui*, the world is fresh and interesting to Martial. Not only men, but things, find him attentive. Thinking of this and of his facility of expression, Verrall says ('Literary Essays, Classical and Modern,' p. 15) that he is "perhaps the only writer in whom plate and tapestry, earthenware and hardware, beds and sofas, become truly poetic." Dimsdale ('Latin Lit.,' p. 472), commenting on his method of attaining vividness by the use of realistic detail, says that "he uses no general expressions such as rich and poor, but speaks in terms of jewelry, scents, linen, cloaks and boots."

Martial is a satirist, but only by accident. He has no moral indignation such as a few years afterward glows from the page of Juvenal. "A certain intolerance of hypocrisy," says Mackail ('Latin Lit.,' p 194), is the nearest approach Martial ever makes to moral feeling. He does not scold; he does not even preach. He manifests no moral enthusiasms, and almost no malice for anything. He is a wit rather than a humorist, though he is by no means without humor. He merely records, and his quality as a satirist is the outgrowth and accompaniment of epigrammatic expression rather than the result of conscious purpose. To portray freely and realistically was in itself to satirize.

The reader's enjoyment of Martial unexpurgated is interfered with by coarseness in about one in 10 of his pieces. This is hardly higher or lower than the modern European average, though his coarseness is not on this account the more welcome. He is also charged with servility in his attitude toward the emperor and other patrons. It should be said in extenuation that literary patronage has until not long ago been a regular and a recognized relation and has always carried with it a certain amount of purely conventional flattery, and that Martial's servility perhaps did not seem so offensive in his own day as it does now, when the servility of the literary art finds expression in other ways. So clean-hearted and clean-lipped a man as the younger Pliny, in expressing regret at the poet's death, has left the word *candor* as descriptive of him: "he was a man of talent, penetrating, keen, with exceeding wit and satire as a writer, and with no less candor." This is probably a reference to the sincerity and frank straightforwardness of Martial the realist, who saw clearly and took no pains to cover up either other men's failings or his own. Of himself he says, "My page is free, my life upright." Of his work he says:

> "Good, fair, and bad
> May here be had.
> That's no surprise!
> Twere vain to look
> For any book
> That's otherwise."
> (Kirby Smith.)

Lovers of Spanish art in general, and of the present day novel in particular, will find themselves wondering whether Martial is not to be explained as merely an ancient example of the truthfulness and directness which so strongly characterize the Spanish genius. Paul Nixon, in "A Roman Wit," gives a spirited rendering, inevitably lacking in finish, of about 200 epigrams. The Bohn Library Martial contains a greater number of translations in both verse and prose. Kirby Smith, in the *Sewanee Review*, Vol. 26, No. 1, may be consulted for appreciation.

GRANT SHOWERMAN.

MARTIN, Saint, of Tours: b. about 316; d. about 400. He attended the catechetical school at Pavia. His father was a military tribune, and compelled him in his 16th year to take up arms. He is said to have early escaped from his father and received instruction in a Christian church. He served under Constantius and Julian, and went to Gaul, where he appeared as the model of all virtue. Among other acts he divided his cloak with a poor man whom he met at the gates of Amiens (Ambianum). The legend says that Christ appeared to him in the following night covered with the half of this cloak. Soon after this vision Martin was baptized, in 337. After living many years in retirement he made a visit to his native place, during which he converted his mother, and opposed with zeal the Arians who prevailed in Illyria. For this he was scourged from the country, on which occasion he manifested the firmness of a martyr. He now established a monastery in Milan, but when he found himself again exposed to persecution took refuge on the island of Gallinaria, in the Ligurian Sea. He next settled at Poitiers, where he assembled a number of monks, and is said to have wrought many miracles. In the year 375 (according to others 371 or 374) the bishopric of Tours was conferred on him against his will. In order to withdraw himself from the world he built the famous convent of Marmontiers, between the river Loire and a steep rock. This is regarded as the oldest abbey of France.

MARTIN, the name of five popes of the Catholic Church, as follows:

MARTIN I, Saint: b. Todi, Tuscany; d. Chersan, Crimea, 16 Sept. 655. He was elected Pope in 649, succeeding Theodore I. He summoned the first Lateran Council at which he caused the doctrine of two wills and operations in Christ to be affirmed. The Emperor Constans II upholding the doctrine which the Council had condemned, took the Pope prisoner and brought him to Constantinople on a charge of treason and then banished him to the Crimea. On account of his sufferings he is numbered among the saints. His day is 12 November.

MARTIN II, or MARINUS I: b. Montefiascone; d. Rome, 14 Feb. 884. He was elected Pope in 882 after the death of John VIII. While bishop of Caere he had been legate for three popes in their negotiations with the East. To English King Alfred he sent a piece of the wood of the cross.

MARTIN III, or MARINUS II: b. Rome; d. 946. He succeeded Stephen VII in 942 and was greatly esteemed for his learning and nobility of character.

MARTIN IV (SIMON DE BRION, sē-môn dė brē-ôn): b. France; d. Perugia, 28 March 1285. He succeeded Nicholas III in 1281, having previously been canon of Tours, and cardinal from 1262. He owed his election in great measure to the influence of Charles of Anjou, whom he supported thereafter and did all in his power to enable that monarch to retain possession of Sicily. In his pontificate occurred the massacre known as "The Sicilian Vespers."

MARTIN V (ODDONE COLONNA, ŏt-tō'nā kō-lŏn'nä): b. Rome, 1368; d. there, 20 Feb. 1431. He was elected Pope in 1417, after the abdication of Gregory XII, and the deposition of John XXIII and Benedict XIII, during the Council of Constance. His first act was to promulgate a bull against the Hussites, remarkable from the circumstance that in it the Pope seems to recognize the supreme authority of the councils. He was one of the ablest of the popes, and through his efforts unity was finally secured to the Church and peace to Italy. In 1418 he dissolved the Council of Constance, though a number of difficulties were not then adjusted, and dissensions continued in the Church. Benedict XIII still lived; and at his death, in 1424, a new anti-pope was elected in Clement VIII, who renounced his pretensions in 1429, when he received the bishopric of Minorca as an indemnification.

MARTIN, Alexander Carson, American missionary and educator: b. Livonia, Ind., 10 April 1827; d. Peking, China, 18 Dec. 1916. He was educated at the University of Indiana, from which he was graduated in 1846. He later studied at the New Albany Theological Seminary (now the McCormick Theological Seminary), at Chicago, from which he was graduated in 1847. The New York University conferred the degrees of D.D. and LL.D. upon him.

He was appointed a Presbyterian missionary to China in 1849 and left here on 23 November of that year for Canton. For 67 years he worked among the Chinese. It was said of him that probably he knew China and the Chinese language as did no other American. Dr. Martin retired from active missionary work in 1868 to enter the Chinese government service. He was named by the Board of Foreign Missions here as an honorary missionary. He acted as interpreter for the United States Minister to China in the negotiations between the Washington government and the Imperial Government, at Peking, in connection with the United States-Chinese treaty of 1853. He was the organizer and president of the International Law and Language School in Peking which was destroyed in the Boxer rebellion in 1900. He was said to have been the first Western teacher to open the door of English learning to the youth of the Far East. After 30 years as adviser to the Chinese government, Dr. Martin became president of the new Imperial University of China. This movement for the establishment of a great institution of learning there was blighted by the Boxer uprising. Later Dr. Martin took the leadership of the Wu Chany University for a period of three years. He retired from this work in 1905. In the same year, when he was 78 years old, he gave up teaching, but remained in the capacity of adviser for both the government and the Presbyterian mission.

MARTIN, Bradley, American banker, brother of Frederick Townsend Martin: b. Albany, N. Y., 1841; d. 1913. In 1863 he was graduated at Union University, Schenectady, N. Y. He served in the National Guard during the Civil War, attaining the rank of lieutenant. Subsequently he was admitted to the bar. He managed his vast interests in banks, trust companies and the industries, and was one of the most prominent figures in the social life of the East. In 1893 he went abroad and thereafter lived in England and Scotland.

MARTIN, Charles Cyril, American civil engineer: b. Springfield, Pa., 30 Aug. 1831; d. Far Rockaway, N. Y., 11 July 1903. He was educated at Rensselaer Polytechnic, Troy. He was engineer in the Brooklyn navy yard during the Civil War; and afterward chief engineer of Prospect Park, Brooklyn; and was appointed John A. Roebling's second assistant in building the Brooklyn Bridge, of which he became chief engineer after Roebling's retirement.

MARTIN, Edward Sanford, American author: b. Owasco, N. Y., 2 Jan. 1856. In 1877 he was graduated at Harvard University and in 1884 was admitted to the bar at Rochester, N. Y. He is a writer of editorials in *Life* and for other weeklies and magazines. His published works are 'Sly Ballades in Harvard China' (1882); 'A Little Brother of the Rich,' verses (1890); 'Pirated Poems' (1890); 'Windfalls of Observation' (1893); 'Cousin Anthony and I' (1895); 'Lucid Intervals' (1900); 'Poems and Verses' (1902); 'The Luxury of Children, and other Luxuries' (1904); 'The Courtship of a Careful Man' (1905); 'In a New Century' (1908); 'Reflections of a Beginning Husband' (1913); 'Unrest of Women' (1913); 'The War Week by Week' (1914); 'The Diary of a Nation' (1917).

MARTIN, Félix, French-Canadian clergyman and author: b. Auray, Brittany, 1804; d. 1886. He emigrated to Canada in 1842, having previously entered the Society of Jesus. His task in Canada was to aid in re-establishing Jesuit missions. Saint Mary's College, Montreal, was founded by him. Père Martin made diligent search in French and Canadian archives seeking out information regarding the early Jesuit missionaries in Canada. His principal works are 'Manuel du pèlerin de Notre Dame de Bon Secours' (1848); 'Relation des Jesuites,' an enlarged edition of O'Callaghan (1850); 'Mission du Canada, relations inédites' (1861); 'De Montcalm en Canada' (1867); 'Le reverend Père Isaac Jogues' (1873).

MARTIN, François Xavier, American jurist: b. Marseilles, France, 17 March 1764; d. New Orleans, 11 Dec. 1846. He emigrated to Martinique when 18; later removed to New Berne, N. C.; taught French there, and became a printer; studied law, being admitted to the bar about 1789; and in 1792 was requested by the State legislature to compile the British statutes in force before the Revolution. He was himself a member of the assembly in 1806–07; was judge of the Mississippi Territory in 1809; went to Louisiana in the same capacity in 1810; and in 1813 became attorney-general of the new State of Louisiana. From 1815 until just before his death Martin was a member of the Supreme Court of the State. Although blind for the last 10 of these 31 years, his ability was

not impaired, and it is due to him that the law of the State was in some measure evolved from the tangle of French and Spanish statutes in which he found it. He wrote a 'History of North Carolina' (1829); 'History of Louisiana' (1827); and a version of Pothier on Obligations.

MARTIN, Frederick Townsend, American author, brother of Bradley Martin: b. Albany, N. Y., 1849; d. London, 1914. In 1872 he was graduated at the Albany Law School. He became a member of the New York National Guard, in which he was commissioned colonel and served a period as judge-advocate. For many years previous to his death he had lived in Europe. He was prominent in charitable enterprises and a lavish benefactor of the poor. His writings deal with the doings of the wealthy and the so-called social-elect, of which class Martin was well qualified to speak. His works include 'The Passing of the Idle Rich' (1911); 'My Personal Experiences of Meeting Snobs' (1911); 'Reminiscences of My Life' (1911); 'Things I Remember' (1913).

MARTIN, George Madden (MRS. ATTWOOD R. MARTIN), American author: b. Louisville, Ky., 3 May 1866. She was educated in the public schools of Louisville, finishing at home on account of her health. In 1892 she was married to Attwood R. Martin. She became a frequent contributor of short stories to magazines and periodicals and is author of 'Emmy Lou—Her Book and Heart' (1902); 'The House of Fulfilment' (1907); 'Abbie Ann' (1907); 'Letitia—Nursery Corps, U. S. A.' (1907); 'Selina,' (1914); 'Emmy Lou's Road to Grace' (1916); 'Warwickshire Lad' (1916).

MARTIN, Gregory, English translator of the Bible: b. Maxfield, Sussex, date unknown; d. Rheims, France, 28 Oct. 1582. Martin received his education at Saint John's College, Oxford, where he took the degree of B.A. in 1561 and that of M.A. in 1565. He was very well versed in Hebrew, Greek and Latin and was made tutor to Philip Howard. Martin opposed the Established Church; remained a staunch Roman Catholic and exerted a powerful influence on the Howards to remain true to the ancient faith. In 1570 his continued opposition to the new ecclesiastical order of things in England obliged him to seek refuge at Douai, Flanders, where he became professor of Hebrew in the newly-founded English College. He went to Rome in 1577 to aid in founding the English College there. In 1578 Martin went to Rheims, to which city the English College was moved from Douai, and there spent his remaining years in writing the production of the English version known as the Douai Bible. It is the official Bible for English Catholics, was made from the Vulgate of Saint Jerome and collated with the Greek and Hebrew versions. In 1582 the New Testament was issued but not until 1609–10 did the Old Testament appear. English Protestants critized Martin's version, yet the commission of Forty-Seven made extensive use of it in preparing the Authorized Version in the reign of James I.

MARTIN, Helen Faucit, LADY. See FAUCIT, HELEN.

MARTIN, Helen Reimensnyder, American author: b. Lancaster, Pa., 18 Oct. 1868. She made a special study of English subjects at Swarthmore College, Pennsylvania, and Radcliffe College, Cambridge, Mass. In 1889 she married Frederic C. Martin. Mrs. Martin is a contributor of short stories of Pennsylvania Dutch life to *McClure's, Leslie's, the Century, Cosmopolitan* and the *Ladies' Home Journal.* She has published 'Tillie, a Mennonite Maid' (1904); 'Cabina, a Story of the Amish' (1905); 'The Betrothal of Elypholate' (1907); 'Revolt of Anne Royle' (1908); 'The Crossways' (1910); 'When Half-Gods Go' (1911); 'The Fighting Doctor' (1912); 'The Parasite' (1913); 'Barnabetta' (1914); 'Martha of the Mennonite Country' (1915); 'For a Mess of Pottage' (1915).

MARTIN, Henry Austin, American surgeon: b. London, 23 July 1824; d. Boston, 7 Dec. 1884. He came to the United States at an early age and was graduated from the medical school at Harvard in 1845, when he established a practice in Boston. He served as a surgeon until nearly the close of the Civil War, when he resigned and was brevetted lieutenant-colonel for gallant service. He devoted his attention principally to surgery and to the treatment of smallpox, upon which subject he was a generally recognized authority. He was the originator of many important innovations in the field of surgery and published valuable professional articles in periodicals.

MARTIN, Henry Newell, American biologist: b. Newry, Ireland, 1848; d. 1896. He received his education at University College, London, and at Christ's College, Cambridge. He was appointed to the chair of biology at Johns Hopkins University in 1876 and was also made director of the biological laboratory. Dr. Martin carried out important experiments on respiration. He was chosen president of the American Society of Naturalists in 1890. He published 'The Human Body' (1881); 'Observations in Regard to the Supposed Suction-Pump Action of the Mammalian Heart' (1887). Professor Martin assisted Huxley in the latter's 'Practical Biology' (1876) and edited 'Studies from the Biological Laboratory of Johns Hopkins' and the *Journal of Physiology.*

MARTIN, Homer Dodge, American painter: b. Albany, N. Y., 28 Oct. 1836; d. Saint Paul, Minn., 12 Feb. 1897. He was elected a member of the National Academy of Design in 1875; and resided in France in 1882–86. While he was influenced somewhat by the Barbizon School of painters, he developed a style entirely his own, which placed him among the best known of American landscape painters. His works include 'Landscape on the Seine'; 'An Equinoctial Day'; 'Brook in the Woods'; 'In the Adirondacks'; 'Sand Dunes on Lake Ontario'; and 'White Mountains, from Randolph Hill.' Consult for reproductions Carroll, D. H., 'Fifty-Eight Paintings by Homer D. Martin' (1913).

MARTIN, Joseph, Canadian statesman: b. Milton, Ontario, 24 Sept. 1852. He was educated in Canadian and Michigan public schools and at the University of Toronto. He was admitted to the bar in 1882 and from 1882 to 1892

was a member of the Manitoba legislature. From 1888 to 1891 he was attorney-general and minister of education of Manitoba. In the latter capacity he introduced the bill abolishing the separate school system in Manitoba and thus precipitated a memorable crisis in Manitoba and Dominion politics. Martin failed of election to the House of Commons in 1891, but sat for Winnipeg in 1893–96. He removed to British Columbia in 1897 and in the following year became a member of the legislature of that province, sitting until 1903. In 1898–99 he was provincial attorney-general and minister of education and in 1900 was premier of British Columbia. In 1907 Martin was owner and editor of the Vancouver *Guardian*. In 1908 he removed to England, contested Southwest Warwickshire in the Liberal interest in 1909. In Canada he took an active part against the Canadian Pacific Railway monopoly, in the abolition of French as official language and advocated the introduction of the Torrens system of land registry. He is a strong freetrader and advocate of reciprocity between the United States and Canada.

MARTIN, Josiah, English colonial governor in America: b. probably in Antigua, West Indies, 23 April 1737; d. London, England, July 1786. He rose to the rank of lieutenant-colonel in the British army in 1771, and in the same year was appointed to the royal governorship of North Carolina. He was successful in pacifying the "regulators," many of whom remained zealous Tories; and took a firm and energetic attitude in the maintenance of British authority. But on 24 April 1775 he was compelled to escape to the sloop *Cruiser*, from which on 8 August he issued a prodigiously long proclamation which the Whigs ordered burnt by the hangman. He was with Sir Peter Parker at Charleston (June 1776), and accompanied Cornwallis into North Carolina after the British victory over Gates at Camden; but in March 1781 withdrew to Long Island, and thence went to England.

MARTIN, Luther, American lawyer: b. New Brunswick, N. J., 9 Feb. 1748; d. New York, 10 July 1826. He was graduated from the College of New Jersey (Princeton) in 1766; studied law at Queenstown, Md.; was admitted to the Maryland bar in 1771; in 1774 was one of the commissioners appointed to oppose the claims of Great Britain; in 1778 became attorney-general of Maryland; and in 1787 was a delegate from Maryland to the convention that framed the Constitution of the United States. His opposition to the instrument was so strong that, rather than sign it, he left the convention, thus earning from Jefferson the sobriquet of "the Federal bull-dog." In 1804 he defended Samuel Chase (q.v.) in the latter's impeachment trial before the Senate, and in 1805 resigned his attorney-generalship and resumed private practice. He was counsel for Burr in Burr's trial at Richmond in 1807, in 1814–16 was chief judge of the Baltimore Court of Oyer and Terminer, and in 1818–20 was again attorney-general of Maryland. Among his writings was the series of pamphlets, 'Modern Gratitude' (1801–02). Consult Goddard, 'Luther Martin' (1887).

MARTIN, Percy F., English author and journalist: b. 30 March 1861. He received his education at University College, London, served as correspondent in Mexico of the *Times*, the *Tribune* and the Glasgow *Herald;* and in India of the *Times* (Engineering Supplement) and the *Evening Standard*. He also served as special correspondent of the *Financial Times* and *The Engineer* in Central and South America and as contributor to the *Times Trade Supplement*. He has published 'Through Five Republics of South America' (1905); 'Mexico's Treasure House' (1906); 'Mexico of the Twentieth Century' (1907); 'Salvador of the Twentieth Century' (1911); 'Peru of the Twentieth Century' (1911); 'Greece of the Twentieth Century' (1912); 'Maximilian in Mexico' (1913); 'The Sudan in Evolution' (1916). He is a contributor to the *Quarterly, Edinburgh, Fortnightly* and *British Reviews*, and other periodicals.

MARTIN, Sir Theodore, English lawyer and author: b. Edinburgh, 16 Sept. 1816; d. 16 Sept. 1906. He was educated at the University of Edinburgh and became a solicitor in Edinburgh in 1840. In 1846 he became a parliamentary solicitor in London, carried on an important and extensive business and varied professional cares with literary work. With Aytoun he published the once famous 'Bon Gaultier's Ballads' (1845). He married in 1851 Helen Faucit, the celebrated actress. His translations comprise many of the works of Goethe, Schiller, Horace, Catullus, etc., and he has written 'Essays on the Drama'; 'Madonna Pia' (1855); 'Life of Lord Lyndhurst' (1884); 'Life of the Prince Consort' (1875–80); 'Helena Faucit, Lady Martin' (1900). He was created K.C.B. in 1881.

MARTIN, Thomas Commerford, American electrical engineer and author: b. London, England, 22 July 1856. He was educated in an academy at Gravesend, England, by a private tutor and subsequently studied divinity. He was associated with Thomas A. Edison in laboratory work and electrical development in 1877–79 since when he has been engaged in editorial work. From 1883 to 1909 he was editor of the *Electrical World* and since 1909 has been executive secretary of the National Electric Light Association. In 1900–15 Mr. Martin was engaged as special expert of the Census office of the United States. He has lectured at the Royal Institution of Engineers, La Société Internationale des Electricians, Paris, the University of Nebraska, Columbia and Lehigh universities, Delaware College and for the New York Board of Education. He was a member of the conference committee organized by engineering societies to expend the $1,500,000 given by Andrew Carnegie for a united engineering building and the Engineers' Club of New York. Mr. Martin is a member of many scientific societies and has published 'The Electric Motor and Its Applications' (1886); 'Inventions, Researches and Writings of Nikola Tesla' (1893); 'Edison — His Life and Inventions,' with F. L. Dyer (1910), and contributions to reference books, magazines and journals on electrical topics.

MARTIN, Thomas F., Democratic leader in New Jersey: b. in New England, about 1868. He came to Hudson County, N. J., in 1896, and worked as a reporter on the *Hudson Dispatch*. Later he became business manager, and when the publishing company failed bought in the property at auction, re-established the paper and made it a political power. Entering politics, he

was chosen to represent North Hudson in the State legislature. For several terms he was the Democratic leader in the House of Representatives, including the years of Woodrow Wilson's governorship. Since 1916 he has been secretary of state of New Jersey.

MARTIN, Thomas Mower, Canadian artist: b. London, England, 1838. He studied art at the South Kensington Art School; removed to Canada in 1862 and settled in Toronto, Ontario. His best-known pictures are 'The Untamed Wilderness'; 'A Summer Idyl'; 'Sunrise, Muskoka.' He was one of the founders of the Royal Canadian Academy, the Ontario Society of Artists, the Art Union of Ontario and the Ontario School of Art. His publications are 'An Artist's Letters from the Rockies' (1889) and 'Canada from an Artist's Point of View' (1895).

MARTIN, Thomas Staples, American legislator: b. Scottsville, Va., 29 July 1847. Since 1853 he has resided on a farm not far from his birthplace. In 1864–65 he was a cadet at the Virginia Military Institute and for much of that period was actually connected with the army of the Confederate States. In 1865–67 he studied at the University of Virginia and in 1869 was admitted to the practice of law. Since 1895 he has been United States senator from Virginia.

MARTIN, Victoria Claflin Woodhull, Anglo-American financier and reformer: b. Homer, Ohio, 23 Sept. 1838. In 1852 she married Canning Woodhull, from whom she later separated. Her second marriage was to John Biddulph Martin who died in 1897. With her sister, in 1870, Mrs. Woodhull founded a stock brokerage house in New York, from which there was issued *Woodhull and Claflin's Weekly.* For many years she has edited the *Humanitarian Magazine.* In 1870 Mrs. Woodhull memorialized Congress for women's suffrage, and lectured throughout the United States on finance, women's suffrage, religious and scientific improvement of the human race, etc. In 1872 she was nominated for the Presidency of the United States by the Equal Rights party. She has organized conventions for the discussion of social reform, carried on a continuous propaganda work in the interests of the working classes both in America and Europe for over 30 years. Mrs. Martin's publications include 'The Origin, Tendencies, and Principles of Government'; 'Social Freedom'; 'Garden of Eden Stirpiculture'; 'Rapid Multiplication of the Unfit'; 'The Human Body the Temple of God'; 'Argument for Woman's Electoral Rights,' etc.

MARTIN, William Alexander Parsons, American educator: b. Livonia, Ind., 10 April 1827; d. 18 Dec. 1916. He was graduated from the Indiana State University and studied theology. He went to China as a missionary in 1850 and has spent the greater share of his life there engaged in educational and missionary work. He assisted in making the treaty between the United States and China in 1858, and was an authority in China on questions of international law. He was professor and president of Tung Wen College 1868–98, and then president of the New Imperial University until 1900, when it was destroyed in the siege of Peking, in which city he was imprisoned with the American legation. In 1902 he was appointed president of the University of Wuchong. He has edited in Chinese the *Peking Scientific Magazine,* and the *Science Monthly,* and has published 'Siege in Peking' (1900); 'Chinese Legends,' 'The Lore of Cathay' (1901), etc.

MARTIN, Winfred Robert, American librarian: b. Ningpo, China, 22 March 1852; d. 1915. In 1872 he was graduated at Princeton University and three years later received the degree of M.A. at the same institution. In 1878 he was graduated at the law school of New York University. For several years subsequently he studied in Germany, receiving the degree of D.Ph. at Tübingen in 1887. He held the chair of Oriental languages and literatures at Trinity College, Hartford, from 1888 to 1907 and from 1902 to 1907 also taught Sanskrit at the Hartford Theological Seminary. In 1907 Dr. Martin was appointed librarian of the Hispanic Society of America. He received the honorary degree of LL.D from Trinity College in 1907 and four years later King Alfonso of Spain created him knight of Isabella the Catholic.

MARTIN DE MOUSSY, Jean Antoine Victor, French physician: b. Moussy-le-Vieux, 1810; d. 1869. His medical education was obtained in Paris, where he practised in the military hospitals. He removed to Montevideo, Uruguay, in 1841 and in 1843–52 directed the medical service of the French and Italians engaged in the siege of the city. In 1852 Dr. Martin was engaged by the Urquiza government to prepare a work on the geography of Uruguay. In order to prepare himself for the task he traveled up and down the country in the years 1855–59. The work appeared in three volumes under the title 'Description géographique et statistique de la confédération argentine' (1860–64). Another volume was his 'Mémoire historique sur la décadence et la ruine des missions des jésuites dans le basin de la Plata' (1865). Dr. Martin presented his meteorological observatory to the city of Montevideo.

MARTIN, a swallow (q.v.). In the United States the name is restricted to the purple martin (q.v.), several other species of which (genus *Progne*) are familiar garden birds in South America. The bank-swallow (q.v.) is sometimes called sand-martin, especially in England, where the term is more generally used as a synonym of "swallow" than in America.

MARTINE, James Edgar, American legislator: b. New York, N. Y., 25 Aug. 1850. He received a public school education. He engaged in farming near Plainfield, N. J., and also acquired large real estate and building interests. At various times he was candidate for the New Jersey house of representatives, the senate and other offices. When Woodrow Wilson was governor of New Jersey Martine was one of his most ardent supporters and became United States senator for the term 1911–17. In the Senate of the United States he warmly championed the cause of labor in the discussions in regard to working conditions, wages, etc., in the coal mines of West Virginia and Colorado.

MARTINEAU, mär'tĭ-nō, **Harriet,** English author: b. Norwich, 12 June 1802; d. Ambleside, 27 June 1876. She was a sister of James

Martineau (q.v.). Her first work, 'Devotional Exercises for the Use of Young Persons,' appeared in 1823; and in 1830–31 she won three prizes offered by the Central Unitarian Association for as many essays designed to convert respectively the Catholics, the Jews and the Mohammedans. "The essays," observes a biographer, "probably converted nobody, but brought in 45 guineas." Next came several stories, mostly intended to inculcate some useful lesson, such as those having the title, 'Illustrations of Political Economy' (1831–34), which were followed by 'Illustrations of Taxation' (1834), and gained an immediate recognition. After a sojourn in the United States (19 Sept. 1834–1 Aug. 1836), she published 'Society in America' (1837), intended as a comparison of "the existing state of society in America with the principles on which it is proposedly founded," and 'A Retrospect of Western Travels' (1838), including some criticisms of slavery that were not well received in this country. Up to about 1851 Miss Martineau had been known as a Unitarian, but she later showed a decided leaning toward Positivism, and in 1853 published a condensation of Comte's 'Positive Philosophy.' Among her other works of importance may be mentioned her 'History of England during the Thirty Years' Peace' (1849). During the last 20 years of her life her writings consisted mainly of pamphlets and contributions to newspapers and periodicals. A remarkably candid autobiography, which had been written for many years, was published after her death (1877). Consult also Miller, 'Harriet Martineau' (1884).

MARTINEAU, James, English Unitarian clergyman and philosopher: b. Norwich, 21 April 1805; d. London, 11 Jan. 1900. His father, Thomas Martineau, the great-grandson of a Huguenot surgeon who left France after the revocation of the Edict of Nantes, was a manufacturer of bombazines. Harriet Martineau (q.v.) was an elder sister. He was sent to Derby in 1821 to study civil engineering, but in the following year became a student of Manchester College. In 1827 he took charge for a year of Dr. Lant Carpenter's school in Bristol, and in 1828 he accepted a call to the copastorship of Eustace Street Presbyterian Church, Dublin. In 1831 he published 'Hymns for Christian Worship,' and next year resigned his pastorate, but shortly afterward accepted the copastorate of Paradise Street Chapel, Liverpool, of which, in 1835, he became sole pastor. In 1836 appeared his first separate original work, 'The Rationale of Religious Inquiry,' which attracted considerable attention. In 1839 he was associated with J. H. Thom and Henry Giles in the defense of Unitarianism against attacks by orthodox clergymen, and of 13 addresses published in 'Unitarianism Defended' (1839), five were by Martineau. In 1840 he published his collection of 'Hymns for the Christian Church and Home,' and in the same year was appointed professor of mental and moral philosophy and of political economy in his old college, now named Manchester New College. On the removal of the college to London in 1853 he retained his professorship, but did not settle in London till 1857. In 1848–49 he spent 15 months on the Continent, mostly in Germany, during which his philosophical opinions were profoundly influenced by the study of Greek and German philosophy under Trendelenburg. The remaining publications of his first Liverpool period are an essay on 'The Five Points of Christian Faith' (1841), and the well-known collection of sermons entitled 'Endeavors after the Christian Life' (1843–47). During the period 1849–57, when he was pastor of Hope Street Church, Liverpool, he published many articles in reviews, among them that on 'Mesmeric Atheism,' which finally completed his sister Harriet's estrangement from him. In 1859, being now in London, he and J. J. Taylor, principal of Manchester New College, were chosen joint ministers of Little Portland Street Chapel, but from 1860 till his resignation in 1872 Martineau alone supplied the pulpit. On Taylor's death in 1869 he became principal of the college, a post which he held till his resignation in 1885. In 1866 he was a candidate for the chair of logic and mental philosophy in University College, London, but the united opposition of orthodoxy and secularism led by George Grotte managed to defeat him by a single vote. His publications include 'Studies of Christianity' (1869), a volume of sermons; 'Why Dissent?' (1871); 'Hymns of Praise and Prayer' (1873); 'Modern Materialism: Its Attitude towards Theology' (1876), a masterly attack on Tyndall and the scientific materialists; 'Essays, Theological and Philosophical' (1875); 'Hours of Thought on Sacred Things' (1876–80); 'Ideal Substitutes for God Considered' (1880), a criticism of Moral Idealism; 'A Study of Spinoza' (1883), his first great philosophical work; and 'Types of Ethical Theory' (1885), the earlier of his two masterpieces. During the remaining years of his life he published his great defense of the essential principles of religion entitled 'A Study of Religion: Its Source and Contents' (1888); and his freely critical 'Seat of Authority in Religion' (1890). The first academical degree conferred upon him was that of LL.D. by Harvard in 1872, but he received later the degrees of S.T.D. from Leyden (1875), D.D. from Edinburgh (1884), D.C.L. from Oxford (1888), and Litt.D. from Dublin (1892). Martineau was one of the most eminent preachers of his time, but his greatest work was done in the fields of ethics and philosophical theology. At first a necessarian and utilitarian, he was latterly the great modern champion of free-will and intuitionalism. In the development of his Christology from a sort of Arianism to complete Humanitarianism, and in his ever-increasing insistence upon the continuity of revelation and the purely internal character of ultimate religious authority, he sums up more than any other the history of Unitarianism, and indeed of liberal theology generally during the 19th century. He was a powerful and eloquent champion of Theism against scientific agnosticism and materialism. All his works are written in a uniquely rhythmic style, characterized by a profuse and happy use of figurative language. Consult Jackson, 'James Martineau: A Biography and a Study' (1900); Sidgwick, 'Lectures on the Ethics of Green, Spencer and Martineau' (1902); Drummond, 'Life and Letters of James Martineau'; and Upton, 'A Survey of Philosophical Work' (1902).

MARTINELLI, mär-tē-nĕl'lē, **Sebastiano,** Italian prelate: b. Lucca, Tuscany, 20 Aug. 1848; d. 5 July 1918. He was educated at the College of Saint Augustine in Rome, entered the Augustinian Order and was ordained to the priesthood in 1871. He became superior-general of the Augustinian Order throughout the world in 1889 and in 1894 was sent to America to visit the monks of that order and shortly afterward was designated apostolic delegate to the United States. At this time he was consecrated titular bishop of Ephesus. His term as delegate was marked by the statesmanlike solution of several important questions. In 1901 he was made a cardinal, returned to Rome soon afterward and became prefect of the Sacred Congregation of Rites.

MARTINEZ, Enriquez, ĕn-rē'kĕth mär-tē-neth, or **Enrico,** Mexican engineer: b. about 1570; d. in Mexico, 1632. His birthplace is variously given as Germany, Holland, Spain (in Ayamonte, Andalusia) or Mexico. He studied engineering in Spain; went to Mexico as interpreter to the Inquisition and with the title of cosmographer royal; and in 1607 undertook to drain the valley of Mexico, threatened by lakes Zumpango and San Cristobal. His canal was fairly successful but inadequate, and after various experiments on the part of the other engineers, with whose work Martinez was accused of tampering, he was bidden enlarge his tunnel and canal. He died before the work was much more than started. Martinez established a printing-press in the City of Mexico and wrote on the natural history of Mexico, on astronomy and on trigonometry. His works are 'Discurso sobre la magna conjunción de los planetas Júpiter y Saturno, acaecida en 24 Diciembre 1603 en Sagitario' (Mexico 1604); 'Repertorio de los tiempos, é historia natural de Nueva España' (Mexico 1606); 'Tratado de Trigonometria.'

MARTINEZ DE CAMPOS, Arsenio. See CAMPOS, ARSENIO MARTINEZ DE.

MARTINEZ DE ROZAS, Juan, hoo-ān' mär-tē-nĕth dā rō'zäs, Chilean statesman: b. Mendoza, Argentina, 1759; d. there, 3 March 1813. He was educated at Cordova; studied law at Santiago; became professor at San Carlos, Chile, in 1781; in 1787 was made assistant intendant of the province of Concepcion; and in 1796 had risen to the second command in the presidency. He took a prominent part in planning the revolution of 1810; was a member of the governing junta until 1811, when he became its president; and showed himself an able administrator and a brave soldier. Carrera quarreled with him, got the upper hand and banished him to his birthplace, only a few months before his death.

MARTINEZ, mär-tē'nĕz, Cal., town, county-seat of Contra Costa County, on the Strait of Carquines, and on the Southern Pacific Railroad, about 30 miles northeast of San Francisco and 85 miles southwest of Sacramento. It is near valuable mines and also rich farm lands, on which large quantities of wheat, grapes, pears, etc., are raised. A novitiate of the Christian Brothers is here and the Brothers maintain a library which has about 6,000 volumes. It has a high school, city hall and courthouse, oil refineries, copper smelters and fertilizer works. Pop. 2,115.

MARTINI, mär-tē'nē, **Simone,** Italian painter, sometimes mistakenly called Simone Memmi: b. Siena, about 1284; d. Avignon, 1344. He was the founder of the Sienese school of painting and executed frescoes in the churches of Siena, Assisi, Naples and Orvieto. At the invitation of Pope Benedict XII he went to Avignon and in collaboration with his brother, Donato, decorated the papal palace. He seems to have aimed at flat decorative effect rather than artistic boldness and originality in his wall painting and his color is harmonious and fresh, though his faces are conventional. The large painting of the Madonna on the walls of the Palazzo Pubblico is his most important work at Siena (1315); at Florence is to be seen an 'Annunciation' of his in the Uffizi, and fragments of his work also survive at Avignon. His other more important pictures are 'The Way to Golgotha' (1333) in the Louvre; 'The Blessing of Christ' in the Vatican; 'Christ as a Child with His Parents' in the Royal Institution, Liverpool; 'Saint Louis of Toulouse' in San Lorenzo, Naples; fragments at Pisa, Arvieto. Fenway Court, Boston, contains some examples of his work. Consult Berenson, Bernhard, 'Central Italian Painters of the Renaissance' (New York 1897).

MARTINIQUE, mär-tĭ-nēk', West Indies, an island of the Lesser Antilles and, except Guadeloupe, the largest in the Caribbean chain. Area, 381 square miles. It is very mountainous (Mount Pelée, in the northwest, 4,900 feet; Mount Carbet but a little lower, while a peak near the southern coast rises to the height of 3,950 feet. The thermometer ranges between 76° and 88° F., the summers being hot and dry, autumn and a part of winter hot and rainy, and spring comparatively cool. The inhabitants number about 185,000. About 3 per cent are Caucasians, who reside chiefly in Saint Pierre; the balance of the population — those who, in the main, suffered least from the disaster of 1902 — are described as negroes, mulattoes, "copre, chabin and matés" — that is, blends of the African, Carib Indian (q.v.), Mongolian and French races. A large part of the surface is covered with forests of silk-cotton, species of mahogany, etc. The flora is closely related to that of South America; the fauna abound in minor reptiles and insects. Of the snake kind the most dreaded is the fer-de-lance, whose bite is fatal. The mongoose has practically exterminated this serpent within recent years. Sugar and cocoa are the chief productions, followed by coffee, tobacco and cotton. There are over 40,000 acres under cultivation and tobacco-growing is subject to special regulation. There are 45 sugar mills and many distilleries. In 1916 sugar to the value of $5,300,000, rum to the value of $5,600,000 and cocoa to the value of $150,000 were exported. In the same year the total of all imports was $6,770,000 and of exports $12,195,000. There entered that year 557 vessels of 465,502 tons.

Martinique is a colony of France, sending one senator and one deputy (two deputies until 1903) to the French legislature. Its affairs are administered by a governor, general council and elective municipal councils. Educational institutions are a law school at Fort-de-France, with 56 students; several secondary or normal schools and about 100 primary schools with

18,000 pupils. The island was acquired by the French in 1635. Toward the close of the 18th and beginning of the 19th centuries it was temporarily held by the British. In May 1902 volcanic eruptions from Mount Pelée destroyed Saint Pierre, which was the largest city on the island, with a population of 26,011, and the residents of that place perished, almost without exception; but the statement commonly made, that "a great part of the island was overwhelmed," is incorrect. The scope of Pelée's work was limited. (See PELÉE, MONT). About 10,000 persons besides those in Saint Pierre lost their lives (in all, 20 per cent of the total population); the best agricultural regions, however, in the south and along the eastern coast were uninjured. The capital, Fort-de-France (pop. 26,399), is situated in the southwest and is important as being the military and naval headquarters and rendezvous in the French Antilles; the terminus of the French transatlantic steamers and West Indian cable system. For local traffic there are mail coaches and motor-cars, which receive a subsidy from the government, and subsidized steamers ply on the coast. The Bank of Martinique, situated at Fort-de-France, has a capital of $600,000. A statue of the Empress Josephine, who was born in Martinique, is one of the ornaments of the public gardens of Fort-de-France. In 1918 the military force consisted of 39 officers and 2,255 men. The capital has had its share of misfortunes in the past: it was nearly consumed by fire in 1890 and partially destroyed by an earthquake in 1839.

MARTIN'S FERRY, Ohio, city, in Belmont County, on the Ohio River and on the Pennsylvania, the Baltimore and Ohio and the Wheeling and Lake Erie railroads, almost opposite Wheeling, W. Va. The first settlement was made in 1769 and in 1865, nearly a century later, it was incorporated as a village. The charter under which it is now governed was granted in 1885. It is situated in a region noted for its abundance of bituminous coal, iron and limestone. The chief manufactures are iron, steel, stoves, shovels, nails, glass, tin, machine-shop products, lumber, barrels and boxes. The city owns and operates the electric-light plant and the waterworks. Pop. 9,178.

MARTINSBURG, mär'tinz-bĕrg, W. Va., city, county-seat of Berkeley County, on the Cumberland Valley and the Baltimore and Ohio railroads, about 65 miles northwest of Washington, D. C. It is in the vicinity of valuable stone quarries and forests which furnish timber for many mills. The chief manufactures are hosiery, woolen goods, lime, wagons, lumber and canned goods. The repair shops of the Baltimore and Ohio Railroad and slate and limestone quarries furnish employment for a number of people. The chief buildings are the government building, the Berkeley Female Seminary, the Berkeley Female Institute and the King's Daughters' Hospital. The waterworks are owned and operated by the municipality. The government is vested in a mayor and council, chosen biennially. It was incorporated in 1778. Pop. 12,032. Martinsburg, as the chief city of the lower Shenandoah Valley, on the main road leading across the Potomac, the converging point of several roads, with the Baltimore and Ohio Railroad running through it, was an important point in the military operations of the valley. Early in July 1861 General Patterson, after a slight skirmish, occupied the place, the Confederates falling back to Winchester. Patterson soon abandoned it, and it was reoccupied by the Confederates. Early in March 1862 it was again occupied by the Union forces under General Banks, the Confederates falling back up the valley. It was abandoned 25 May 1862, after Banks' defeat at Winchester, but soon reoccupied by Banks. On 8 Sept. 1862 Gen. Julius White was in command of the place with about 2,500 men of all arms. At this time General Lee had crossed the Potomac and was at Frederick, Md. On the 10th Jackson led a column from Frederick, crossed the Potomac at Williamsport and moved on Martinsburg. White retreated during the night of the 11th to Harper's Ferry. In June 1863, when Ewell's corps moved down the valley in the Gettysburg campaign the place was held by Col. B. F. Smith with 1,200 infantry and a battery. On 13 June, Ewell, at Cedarville, detached Jenkins' cavalry brigade and Rodes' infantry division to surround and capture the Union forces at Berryville and Martinsburg. Both garrisons escaped, Smith, with the greater part of his infantry, crossed the Potomac at Shepherdstown and making his way to Maryland Heights. The battery retreated by the Williamsport road, was pursued and lost five of its six guns, with 200 infantry accompanying it. On 1 July 1864 the place was held by General Sigel with about 3,200 infantry and dismounted cavalry and a battery. On the 2d, Early arrived at Winchester on his campaign to menace Washington and, under General Lee's instructions, to clear out the lower valley and wreck the Baltimore and Ohio Railroad. Parties were sent north and west against the railroad, and on the 3d Bradley T. Johnson, with a cavalry brigade, was ordered to move through Smithfield and Lee Town, cross the railroad at Kearnysville, east of Martinsburg, and, pushing north, unite with McCausland at Hainesville beyond Martinsburg. Johnson arrived at Lee Town early in the morning, where he was met by Col. J. A. Mulligan with about 2,000 men and a battery, and after a hard fight was driven back on the divisions of Rodes and Ramseur, which were supporting him. Breckinridge's division, which marched on the main road to Martinsburg, drove before it Stahel's cavalry, on outpost at Darkesville. Sigel, warned of approaching danger, burned his stores, collected his command, and, leaving Martinsburg on the night of the 3d, crossed the Potomac at Shepherdstown and occupied Maryland Heights. Early cleared the valley and advanced on Washington, and on the 11th Martinsburg was occupied by Sullivan's division of Hunter's command, and remained in Union occupation until the 25th, when Crook, being defeated by Early at Kernstown, was driven through Winchester, made a short stand at Martinsburg and recrossed the Potomac at Williamsport, Early again occupying the town and destroying the railroad on either side of it, and continuing in possession until 10 August, when, upon Sheridan's advance to Halltown, he abandoned Martinsburg and Winchester and fell back to Strasburg. He advanced from Strasburg on the 17th and reoccupied Martinsburg

on the 19th with his cavalry. From this time until 17 September the place was held alternately by Union and Confederate cavalry, on the 17th by Averell's Union division. On that day Early left Winchester with a heavy force of infantry, cavalry and artillery, and on the 18th attacked and drove Averell from Martinsburg across the Opequon. Sheridan defeated Early on the Opequon on the 19th, and drove him up the valley, and Martinsburg was again occupied by Union troops, to remain in their possession until the close of the war.

MARTINSVILLE, Ind., city, of Morgan County, situated on White River, the Cleveland, Cincinnati, Chicago and Saint Louis and the Vandalia railroads, 30 miles southwest of Indianapolis. It enjoys considerable reputation as a health resort, having several artesian mineral wells and modern sanatoria. It contains flour mills, planing and saw mills, brick yards, chair works and a woodenware factory. The city owns the electric-lighting plant and the water-supply system. Pop. 4,529.

MARTINSVILLE, Va., town and county-seat of Henry County, situated on the Danville and Western and the Norfolk and Western railroads, 40 miles northwest of Danville. It contains several fine public buildings, including the town-hall, courthouse, post office and high school. Its industrial establishments include cotton mills, tobacco warehouses, furniture and spoke factories. It has large farming interests, and the Roundabout stock farm is a show place. The electric-lighting, telephone and water-supply plants are the property of the municipality. Pop. 3,368.

MARTINY, Philip, American sculptor: b. Alsace, 19 May 1858. His boyhood was spent in France working in various studios. Early in the 80's he came to America and made further studies under the direction of Saint-Gaudens. Martiny's efforts in decorative sculpture have been conspicuously successful and his work has improved this branch of art in the United States. Among his best-known works are the sculpture on the grand staircase of the Congressional Library, Washington; the Carnegie Library, Washington; the New York Hall of Records; Chamber of Commerce groups, New York; bronze doors of Saint Bartholomew's, New York; a fountain and figures in the Clark residence, New York; Soldiers' and Sailors' Monument, Jersey City; McKinley Monument, Springfield, Mass.; statue of Vice-President Hobart at Paterson, N. J., and the de Gernay Monument at Newport, R. I.

MARTY, Martin, Roman Catholic bishop: b. Schwyz, Switzerland, 12 Jan. 1834; d. Saint Cloud, Minn., 19 Sept. 1896. He received a collegiate education in Switzerland and Austria, was ordained to the priesthood in 1856 and in 1860 came to the United States. He assisted in the founding of a priory at Saint Meinrad's, Ind., and was its first superior; through his efforts the priory became an abbey in 1870 and Marty was raised to the rank of mitred abbot. He resigned his office several years later in order to perform mission work among the Indians of Dakota, over whom he gained a wide influence. He mastered their language and wrote a Sioux grammar and dictionary. In 1880 he became the first bishop of Sioux Falls, and in 1894 was transferred to Saint Cloud, Minn.

MARTYN, mär'tin, **Henry,** English missionary to India: b. Truro, Cornwall, 18 Feb. 1781; d. Tokat, Asia Minor, 16 Oct. 1812. He was graduated from Saint John's College, Cambridge, in 1801; became a Fellow of the same college in the next year, and, turning from the law, took orders, and landed in India in 1806. After three years at Dinapore he was transfered to Cawnpore, where he opened a church in 1810, in spite of violent opposition, and where he completed a Hindustani version of the New Testament. To perfect a translation of the New Testament into Persian and to recover his health in 1811 he traveled into Persia. In Tabriz he was taken ill with a fever, and on his hurried journey home was compelled to stop at the plague-stricken town of Tokat, where he died. In 1856 a monument to his memory was erected there. He was the great missionary hero of the Church of England up to the early part of the 19th century. Martyn's works include 'Controversial Tracts on Christianity and Mohammedanism' (1824), and versions of various parts of the Bible into Hindustani, Persian and Judæo-Persic. Consult Bell, C. D., 'Henry Martyn' (New York 1881); Smith, George, 'Henry Martyn, Saint and Scholar, First Modern Missionary to the Mohammedans, 1781–1812' (London 1892); Wilberforce, Samuel (ed.), 'Journals and Letters of the Reverend Henry Martyn' (2 vols., London 1837).

MARTYN, William Carlos, American Presbyterian clergyman, historical writer and lecturer: b. New York City, 15 Dec. 1841; d. 4 Aug. 1917. He studied law at Columbia under Prof. Theodore Dwight, 1859–60, and was graduated from Union Theological Seminary in 1869 and ordained to the Congregational ministry. He held important charges in Saint Louis, Chicago and New York; 1897–1902 was literary director in a New York publishing house, and has contributed largely to magazines and periodicals. His historical and biographical works cover a wide circle and include 'Martin Luther' (1866); 'John Milton' (1866); 'Pilgrim Fathers of New England' (1870); 'The Puritans' (1867); 'The Huguenots' (1867); 'The Dutch Reformation' (1868) 'John B. Gough' (1893); 'William E. Dodge' (1891), and 'Wendell Phillips' (1890), this last having an enormous circulation. In other veins were a work on 'Christian Citizenship' (1896), and a novel, 'Sour Saints and Sweet Sinners' (1898). Since 1905 Dr. Martyn has resided in Noroton, Conn., and has served the Presbyterian church there. At various times and places literary honors and dignities have come to him.

MARTYNIA, a genus of annual and perennial herb of the family *Martyniaceæ*. The 10 species have thick sub-erect stems, opposite or alternate heart-shaped leaves, showy catalpa-like flowers in short terminal racemes, and horned capsules which suggest the names unicorn plant and proboscis-flower. When ripe the capsules split and expose numerous black wrinkled seeds. The stems and foliage are clammy and malodorous, but the flowers of some species not unpleasantly perfumed. The species are all natives of warm parts of America. They are often planted for ornaments, as curiosities and for their capsules, which while

young and tender are used as material for pickles. *M. louisiana,* to which the popular names are generally applied, is the most commonly grown.

MARTYR (Greek for «witness»), a designation applied by the Christian Church to those persons in particular who, in the early ages of Christianity, suffered death rather than renounce their faith, and thus testified their confidence in the truth of the new doctrines. Martyrs are sometimes classified as of three classes: martyrs in will and deed, like Saint Stephen; those in will, but not in deed, like Saint John, who escaped from the death ordained for him by Domitian; and those in deed but not in will, like the Holy Innocents. An account of the life, persecutions and death of the Christian martyrs is called a martyrology (q.v.). A tomb or oratory erected on the spot where a martyr suffered was called martyrium, martyry. Festivals in honor of the martyrs seem to have been observed as early as the 2d century. The Christians offered prayers at the martyry and thanked God for the example which they had given to the world. The rite was concluded with the sacrament of the Lord's supper and the distribution of alms. Eulogies were also delivered and accounts of the lives and actions of the deceased read. These festivals were called the birthdays of the martyrs, because on the day of their death they were born to eternal life. There are 14,000 martyrs commemorated in the Roman martyrology. In the early centuries of Christianity the bishop of the locality certified the names of those who were deemed worthy of the title of martyr, but after 1100 this designation became more and more reserved to the Pope, especially since 1636.

MARTYR, mär'ter, **Peter.** See PETER MARTYR.

MARTYRE DE SAINT SEBASTIAN, Le (The Martyrdom of Saint Sebastian), an oratorio by Debussy which had its first performance at Paris on 22 May 1911.

MARTYROLOGY, called also calendar of the saints, the acts of the saints, menology, anology, synaxary, a list of martyrs and other saints, in which was sometimes noted the character of their lives, and in the case of a martyr the place and date of his martyrdom and the nature of the sufferings which he underwent. Baronius, an ecclesiastical historian of the 16th century, attributes to Saint Clement of Rome, almost contemporary with the apostles, the first idea of collecting the acts of the martyrs. In the time of Gregory the Great (end of the 6th century) the Church possessed a general martyrology, the author of which is said to have been Saint Jerome, who made use of materials collected by Eusebius of Cæsarea. The only part of it now extant is a catalogue of the martyrs who suffered in Palestine during the last eight years of the persecution of Diocletian. There is a martyrology attributed to Bede (beginning of 8th century), but if not altogether spurious it is at least interpolated. Numerous martyrologies were produced in the next century and subsequently. In 1586, under the auspices of Sixtus V, a martyrology was printed at Rome, with notes by Baronius, with the title of 'Martyrologium Universale.' Ruinart's 'Acta Primorum Martyrum Sincera' appeared at Paris in 1689, and a new edition of it was published in 1859. The 'Acta Sanctorum' (q.v.) of the Bollandists comprises over 60 volumes issued at various times from 1643, but the work is still incomplete. The well-known English work of John Foxe, 'The Book of Martyrs' (Protestant), may also be mentioned. Consult Achelis, 'Die Martyrologien, ihre Geschichte und ihr Wert' (Berlin 1900); Lämmer, 'De Martyrologio Romano, Parergon Historico-criticum' (Regensburg 1878); 'Martyrologium Sancti Hieronymi' (in 'Acta Sanctorum' for November, Paris 1894); Kenrick, Francis P. (ed.), 'The Roman Martyrology' (Baltimore 1907); Delhaye, 'Le témoignage des martyrologes' (in 'Analecta Bollandiana,' Vol. XXVI, Paris 1907).

MARULIC, Marko, a Croatian poet and historian: b. Spalato in 1450; d. 1524. After studying at Padua he entered a monastery in Spalato, where he wrote most of the works which stamped him as the foremost of Croatian authors and rendered his name one of the greatest in the literature of Ragusa. Among his works the most noted was 'De Institutione Bene Vivendi,' published in 1511. It was translated several times. In his native tongue he wrote mystery plays, the first of their kind in the Croatian language, and several poems, best of which is 'The History of Judith.' His poems were republished with a biography (Agram 1869).

MARVEL, Ik. See MITCHELL, DONALD GRANT.

MARVELL, Andrew, English poet and satirist: b. Winestead, Holderness, Yorkshire, 31 March 1621; d. London, 18 Aug. 1678. He was graduated from Trinity College, Cambridge, in 1638; after activity as poet and tutor became colleague of Milton in the Latin secretaryship in 1637; was three times elected to Parliament for Hull, and under the Restoration attacked Charles II and advocated a republic. While a true literary genius most of Marvell's work has little appeal to moderns, because it deals with persons and incidents long since passed away and forgotten. His lyrics, however, are immortal, and through them his place in English literature is assured for all time. His chief poem is the 'Horatian Ode Upon Cromwell's Return from Ireland' (written 1650; first printed 1776). The shorter poem, 'The Bermudas,' is also well known. Consult his 'Works,' edited by T. Cooke (2 vols., London 1726); 'Works,' edited by E. Thompson (3 vols., London 1776); 'Poems and Satires,' edited by G. A. Aitken (2 vols., ib. 1892); 'Poems and Satires,' edited by E. Wright (ib. 1904); Birrell, Augustine, 'Life of Andrew Marvell' (in 'English Men of Letters Series,' London 1905); Brown, John, 'Andrew Marvell' (in 'Cambridge History of English Literature,' Vol. VII, Cambridge 1911); Dove, 'Life of Andrew Marvell' (London 1832).

MARVIN, Charles Frederick, American meteorologist: b. Putnam, Ohio, 7 Oct. 1858. He was graduated as a mechanical engineer from the Ohio State University in 1883, where he had been instructor in mechanical drawing and laboratory practice since 1879. In 1884 he was appointed to the United States Signal Service and later was made professor of me-

teorology in the weather bureau, of which he became chief in 1913. He has made many important investigations and discoveries in connection with the weather bureau, and has written quite extensively concerning them.

MARVIN, Enoch Mather, American Methodist Episcopal clergyman: b. Warren County, Mo., 1823; d. 1877. He was self-educated; became a minister of the Methodist Episcopal Church in 1841 as member of the Missouri Conference. Upon the division of the Methodist body in 1844 he cast his lot with the Methodist Church South. In the Civil War he was for two years a chaplain in the Confederate army. He was chosen bishop of his Church in 1866 and at the time of his death had just returned from a missionary tour which took him all around the world. He published 'Errors of the Papacy and Transubstantiation' (1860); 'The Life of William Goff Caples' (1871); 'Sermons' (1876); 'The Doctrinal Integrity of Methodism' (1878); 'To the East by Way of the West' (1879); 'The Methodist Episcopal Churches, North and South.' Consult Finney, T. M., 'The Life and Labors of Enoch Mather Marvin' (Saint Louis 1880).

MARVIN, Frederic Rowland, American clergyman, essayist and poet: b. Troy, N. Y., 23 Sept. 1847; d. 22 July 1918. Son of Rev. Uriah and Margaret Jane (Stevens) Marvin; educated at Lafayette and Union colleges, College of Physicians and Surgeons, New Brunswick Seminary; sometime professor in New York Free Medical College for Women; pastor of Congregational churches in Middletown, N. Y., Portland, Ore., Great Barrington, Mass., retiring in 1895 for study and travel in Europe; settled at Albany, N. Y., since 1900. Among his works are 'Literature of the Insane'; 'Epidemic Delusions'; 'Last Words of Distinguished Men and Women'; 'Book of Quatrains'; 'Excursions of a Book-Lover'; 'Poems and Translations'; 'Companionship of Books'; 'Christ Among the Cattle'; 'Flowers of Song from Many Lands'; 'Love and Letters'; 'Fireside Papers.' Consult also 'The Top of the Wine-Jar,' a volume of selections from the author's 10 works, with a literary estimate by Livingston Stebbins.

MARX, märks, **Karl,** German Socialist: b. Trèves, 5 May 1818; d. London, 14 March 1883. He was educated at the universities of Bonn and Berlin, and in 1842 took up journalism, becoming editor of the *Rheinische Zeitung,* a Democratic journal; his socialistic articles in this paper caused its suppression in 1843. Marx then proceeded to Paris, where he became one of the editors of the *Deutsch-Französische Jahrbücher,* to which he contributed articles on the "Hegelian Philosophy of Right." He was expelled from France in 1845, and retired to Brussels, where he assisted in organizing the German Workingmen's Association, was also active in the organization of the Communist League, and with Engels issued the famous Communist Manifesto in 1847, which was the first public declaration of international Socialism. In 1848 Marx returned to Germany, started the *Neue Rheinische Zeitung,* and was active in the revolutionary movements of that year. Banished from Germany in 1849, he went first to Paris, then to London, where he lived till the time of his death. He devoted himself largely to the study of economic questions, and was correspondent of the New York *Tribune* and other papers. In 1864 he took a leading part in the organization of the International Workingmen's Association (q.v.), was selected to formulate its program and practically shaped its policy for a number of years; he was also interested in the organization of the German Social Democrats who united with the International in 1869. After 1873 he took no active part in politics, but devoted his time to the completion of his work on capitalism, 'Das Kapital' ('Capital'), the first volume of which had been published in 1867 (English trans. 1886); the second and third volumes were left in manuscripts, and volume II was published in 1885; volume III in 1894, under the editorship of Engel. He also wrote 'Zur Kritik der Politischen Oekonomie' (1859); 'Lohnarbeit und Kapital' (English trans., 'Wage Labor and Capital'); 'Misère de la Philosophie' (1847); 'The 18th Brumaire of Louis Bonaparte' (1852); 'Life of Lord Palmerston' (1850), and 'Revolution and Counter-Revolution,' a reprint of a series of letters in the New York *Tribune,* in regard to the Revolution of 1848 in Germany.

Marx was undoubtedly the founder of the modern socialistic school, in that he first gave definite scientific statement to the principles of modern Socialism. His greatest and best-known work, 'Das Kapital,' is a monument of acute reasoning, extensive reading and knowledge, though excessively long, obscure and tortuous in its meanings. In this he analyzes carefully his theory of value, which is that the measure of the value of a commodity is the amount of labor "socially necessary" to produce it, and shows how under the capitalistic system the laborers are exploited of what they produce over and above their wages (surplus value). These theories were by no means new, though Marx rather confused than elucidated them. He also traces the development of capitalistic production, the growth of the working class or proletariat which is finally to transform or revolutionize society, and lays down the principle that the fundamental factor in the development of society is the method of production and exchange; hence the Socialist movement must simply assist and hasten the changes in progress. Marx was not only a scholar and thinker, but an organizer and agitator of unusual power. (See SOCIALISM). Consult Aveling, 'The Student's Marx' (London 1892); Deville, 'The People's Marx,' for epitomes of 'Capital.' Consult also Böhm-Bawerk, 'Karl Marx and the Close of His System' (New York 1898); Boudin, L. B., 'Theoretical System of Karl Marx in Light of Recent Criticism' (Chicago 1907); Croce, B., 'Historical Materialism and the Economics of Karl Marx' (New York 1914); Spargo, John, 'Karl Marx, His Life and Work' (ib. 1910); id., 'Sidelight on Contemporary Socialism' (ib. 1911).

MARY, the mother of Jesus, is known in the Catholic Church as the Blessed Virgin Mary. The name is from the Gr. *Μαριάμ* (Mariam) or *Μαρία* (Maria), which in turn is from the Heb. Miryām, a word of uncertain meaning. The New Testament narrative is silent as to her parentage and the place and date of her birth. From tradition and other sources we

learn that her father was Joachim and her mother Anne, that by them she was presented in the temple at Jerusalem when she was three years old, and that in the temple she remained until the age of 12 or thereabouts. Her birthplace is variously stated as being Nazareth, Sephoris (Diocæsarea), or Jerusalem. In early youth she was betrothed to Joseph, a carpenter, a scion of the house of David. She probably belonged herself to the same royal lineage. At all events, she was a cousin of Elizabeth, wife of the priest Zachary and mother of John the Baptist. While Mary was betrothed to Joseph, and before her marriage, she was visited at Nazareth, a city of Galilee, by the angel Gabriel, who announced to her that, by the operation of the Holy Ghost, she should conceive and bring forth a son, to whom was to be given the name Jesus, who should be called the son of the Most High, and who should reign over the house of Jacob forever. The angel also said that her cousin Elizabeth had conceived a son in her old age, and was then in the sixth month of her pregnancy. Mary thereupon visited Elizabeth in the hill country of Judah, and, in response to Elizabeth's salutation, "Blessed art thou among women, and blessed is the fruit of thy womb," she uttered under divine inspiration the glorious canticle of praise known as the 'Magnificat.' The visit lasted about three months. On her return to Nazareth, Mary "was found with child of the Holy Ghost." Joseph, however, was in a dream told by an angel of the true condition of affairs, and, instead of putting her away privately, as was his first impulse, he concluded the ritual marriage with her. Some few months later, in obedience to a decree of Cæsar Augustus prescribing a general enrolment, Joseph went from Nazareth in Galilee to the city of David, Bethlehem in Judæa, because he was of the house and family of David, to enrol himself with Mary, who was then great with child. There was no room for them in the inn, and so in a grotto, which served as a shelter for animals, Mary gave birth to her son. On the eighth day afterward the child was circumcised, and was called Jesus, in accordance with the instruction previously given by the angel Gabriel. Thirty-three days later Mary complied with the law of Moses (Lev. xii, 2–8) by offering herself in the temple at Jerusalem for legal purification, and at the same time she presented her child to the Lord in accordance with Ex. xiii, 2, 12 and Num. xviii, 15. On this occasion Simeon pronounced the canticle of joy known as 'Nunc dimittis.' He told Mary that her child was set for the fall and for the resurrection of many in Israel and for a sign that should be contradicted, and that her own soul a sword should pierce. Anna the prophetess, on the same occasion, confessed to the Lord, and spoke of the child to all that looked for the redemption of Israel. A great danger threatened the life of Mary's son. Herod the Great, king of Judæa, having seen and questioned the Wise Men who had come from afar to pay homage to the newly-born King of the Jews, whose star they had seen in the East, concealed the alarm which these strange tidings caused him, directed the strangers to Bethlehem as the city indicated by prophecies for the birth of Christ, and adjured them to let him know, on their return to Jerusalem, where the young king was to be found, so that he too might come and pay him homage. The Wise Men, after offering to the infant Jesus their gifts of gold, frankincense and myrrh, were warned by God in a dream not to go back to Herod, and accordingly they departed by another way into their own country. Herod, not hearing from them, was enraged, and issued an order that every male child two years of age and under in Bethlehem and its borders should be put to death. In the meantime, Joseph, being warned by an angel, had taken the child and his mother and fled into Egypt, and thus the infant Jesus escaped the Slaughter of the Innocents. How long the sojourn in Egypt lasted we do not know. What we are told is that Joseph, advised by an angel of the death of Herod, returned to the land of Israel, but, learning that Archelaus was reigning in Judæa in the room of Herod his father, he decided to go, not to Bethlehem, but to Nazareth, and in the latter city the Holy Family took up their abode.

The chronology of Matthew and the chronology of Luke, the only evangelists who give an account of the events immediately preceding and immediately following the birth of Christ, are at first sight somewhat confusing, but they are not conflicting, and are quite capable of reconcilement, although in this case, as in so many others, the reconcilement will not wholly square with the popular belief.

After the return to Nazareth, Mary makes but few appearances in the Gospel narrative. We learn that she and Joseph went every year to Jerusalem at the solemn day of the pasch, and that on one of those occasions they lost Jesus, who was then 12 years old, and did not find him until after a three days' search. We next find her at the marriage feast at Cana in Galilee, where Jesus, at her request, performed his first public miracle by changing water into wine. After this she accompanied Jesus to Capharnaum. Once the mother and brethren of Jesus sought to speak to him, but could not reach him for the crowd. During the passion, Mary stood by the cross of Jesus on Calvary, and from the cross Jesus commended her to John, who from that hour took her to his own. The last mention of her in the New Testament occurs in the Acts of the Apostles i, 14, where it is written that, between Ascension and Pentecost, the apostles were in an upper room in Jerusalem persevering with one mind in prayer with the women, and Mary the mother of Jesus, and with his brethren. After that time we have no certain information as to where she lived, nor do we know when and where she died. One tradition says that she lived with Saint John at Ephesus and died there; another, that she lived and died at Jerusalem. Baronius, in his 'Annals,' gives the date of her death as A.D. 48. In fixing that year he relied on a passage in the 'Chronicon' of Eusebius; but there is grave doubt as to the genuineness of that passage in the 'Chronicon,' and the present tendency is to regard it as a later interpolation. The general, perhaps even universal, belief among Catholics is that after her death Mary's body, as well as her soul, was assumed into heaven; but this bodily assumption has not yet been made a matter of faith. The Catholic Church teaches that Mary was conceived without original, or racial, sin; that she never com-

mitted actual, or personal, sin; that she was truly the mother of God; and that she always remained a virgin. The doctrine of the Immaculate Conception (q.v.) was not explicitly discussed until the 12th century; but it is claimed that it is implicitly contained in the teachings of the early Fathers of the Church. The festival of the Conception of the Blessed Virgin was certainly celebrated in the Greek Church in the 7th century. It was possibly kept in Spain in the same century. It was observed in Ireland as early as 900, in parts of Italy before 1000, and in England, France and Germany in the 12th century. Saint Bernard, himself a devout client of Mary, upbraided the canons of Lyons for instituting (1140) such a festival without the sanction of the Holy See. He himself did not admit that her conception was sinless. Saint Thomas Aquinas, the Dominican, and Saint Bonaventura, the Franciscan, hesitated to accept the doctrine of the Immaculate Conception on the ground that, unless Mary had been at some time one of the sinful, she could not truly be said to have been redeemed by Christ. John Duns Scotus, the Franciscan, put forward, on the other hand, the doctrine of preredemption. He held that it was as high a tribute to the merits of Christ to assert that Mary was by Him kept free from all taint of original sin, as to say that she first contracted sin and was subsequently delivered from it. This view, at first seriously and even angrily contested, gradually spread, and gathered force and momentum with the progress of time. The Council of Trent declared that in its decrees on original sin it did not include "the blessed and immaculate Virgin Mary, Mother of God." At length Pope Pius IX, on 8 Dec. 1854, promulgated the Bull, *Ineffabilis Deus*, in which is given the authoritative definition, as follows. "We define that the doctrine which holds that the Blessed Virgin Mary, from the first instant of her conception, was, by a singular grace and privilege of Almighty God, in view of the merits of Jesus Christ, the Redeemer of the human race, preserved from all stain of original sin, is a doctrine revealed by God, and therefore to be firmly and steadfastly believed by all the faithful." The dogma of the Immaculate Conception is rejected by the general body of Protestantism, by many schismatics, and by the sect known as Old Catholics.

Scripture and tradition agree in attributing to Mary the greatest personal sanctity, and there is no dispute that the Church has always held her to be free from the commission of actual, or personal, sin. Saint Augustine crystallizes this view when he says ('De natura et gratia,' c. 36) that, out of honor to the Lord, he wishes no question to be made of the holy Virgin Mary when sin is treated of. Her complete freedom from actual sin is confirmed by the Council of Trent (Sess. VI, can. 23): "If any one say that man, once justified, can during his whole life avoid all sins, even venial sins, unless by a special divine privilege, as the Church holds in regard to the Blessed Virgin, let him be anathema."

In the New Testament Mary is called "the mother of Jesus" (John ii, 1, xix, 25, 26; Acts i, 14) and "mother of my Lord" (Luke i, 43), and there are attributed to her the usual functions of motherhood, namely, conception, gestation, parturition, and giving suck; but she is not specifically designated "mother of God." The belief that that title was properly her due prevailed, however, in the Church from the beginning. The term Θεοτόκος (Lat. *Deipara* = mother of God) was probably first formally applied to her toward the end of the 3d century by theologians of Alexandria. It occurs, for example, in the works of Origen. It came into common use in the 4th century, being found in the writings of Eusebius, Athanasius, Didymus, and Gregory of Nazianzus. As Saint Cyril of Alexandria put it (*De Recta Fide ad Regin.*, c. 9), "This name Θεοτόκος was perfectly familiar to the ancient Fathers." Nestorius, however, contended that Mary was not rightfully called mother of God, as she was the mother, not of God, but of a mere man. Thereupon the Council of Ephesus (431) laid it down as an article of faith that Mary is really and truly the mother of God. The words of the decree are: "If any one does not confess that Emmanuel is truly God and consequently that the holy Virgin is the mother of God (Θεοτόκον, *Dei genitricem*) — inasmuch as she gave birth in the flesh to the Word of God made flesh, according to what is written: 'The word was made flesh' — let him be anathema." This decree was confirmed by several later Councils, e.g., Chalcedon (451) and Constantinople (553). It may be added that this teaching was sanctioned in the English Church, for in the first Book of Common Prayer (1549) Mary is called "mother of Thy Son Jesus Christ our Lord and God," and it is still accepted by many, perhaps most, Anglican divines.

The title ἀεὶ παρθένος (Lat. *semper virgo*, ever virgin, always a virgin), which represents a very early belief in the Church, was incorporated in the Creed by the Fifth Ecumenical Council of Constantinople in 553 — "qui de coelis descendit et incarnatus de sancta gloriosa Dei genitrice et semper virgine Maria (ἐκ τῆς ἁγίας ἐνδόξου Θεοτόκου καὶ ἀειπαρθένου Μαρίας) natus est ex ea." The doctrine of Mary's perpetual virginity, that is, that she remained a virgin before, during, and after parturition, was further emphasized by the Lateran Council in 649 and by the Sixth Ecumenical Council of Constantinople in 680. It is indisputably orthodox both in the Eastern and the Western Church. It is not accepted by Protestants in general, and has been the object of severe attack by modern Rationalists and infidel Bible critics.

The principal feasts held in honor of the Blessed Virgin are the Purification, 2 February (14 February in the Armenian Church); the Annunciation, 25 March; the Visitation, 2 July; the Assumption, 15 August; the Nativity of Mary, 8 September; the Presentation of Mary in the Temple, 21 November; and the Immaculate Conception, 8 December (9 December in the Eastern Church). There are, besides, many minor feasts, some locally celebrated, and others general.

Devotion to the Blessed Virgin has been prevalent in the Church from very early times. It received a fresh impetus from the above-mentioned decree of the Council of Ephesus. The relationship of motherhood in which Mary had been declared to stand to God, stamping as authoritative the already existing popular

belief, made invocation of her as a powerful intercessor with her divine Son a natural corollary, and devotion to her grew apace. In the Middle Ages it was widespread. In England it was so common and entered to such an extent into practical life that that country was long known as Mary's Dowry. The prominence which Mary had thus attained in Roman Catholic devotions and in popular estimation produced a reaction among the Reformers. They believed indeed in the birth of Christ from a pure virgin, who was consequently to be honored as His mother; but their fundamental position, that the justification and salvation of sinful man are accomplished through faith in Christ alone, caused them to repudiate the idea of a mediator with *the* mediator, of any creature coming as intermediary between the soul and Christ. The inevitable result, among Protestants, was an immediate dethronement of the mother from her high place as intercessor with her Son, and the immediate or later denial and striking away of some of her proudest prerogatives. This change of attitude is made evident, for example, in the first Book of Common Prayer (1549) of the English Church, in which the words of the Sarum rite, "glorious and ever Virgin Mary," are changed to "glorious and most blessed Virgin Mary," and still more evident in the second Book (1552) and in the 15th and 22d Articles of Religion (1553). In some sections the Puritan element in Protestantism carried its feeling against Mary so far as to scruple the singing of the 'Magnificat,' and to abandon the public use of the Apostles' Creed because her name occurs in it. Even as recently as 1898 this spirit of opposition to any honor or invocation of Mary succeeded in securing the rejection of the 'Stabat Mater' from the 'Church Hymnary' and the removal of the words, "Son of Mary," from one of the hymns. Such extremes, however, brought about another reaction. In the 18th century even the Scottish Church introduced the Virgin into the public services in one of its "Paraphrases," in another restored the use of the 'Magnificat' in metre, and in recent years authorized the singing of it in prose and the recital of the Nicene and Apostles' Creeds. The English liturgy never abandoned these. Further, it retained, and still retains, in its Calendar, among the "Feasts to be observed," several festivals of the Blessed Virgin. Many Scottish and English divines have written of Mary in terms of great reverence, tenderness, and beauty.

It may be fairly stated that at no time in the history of the Catholic Church have love of Mary and devotion to her been purer or more extensive and intensive than they are at the present day (1919). The Ave Maria is second only to the Lord's Prayer in frequency of use. The Rosary and the Litany of the Blessed Virgin are recited publicly and privately by millions of persons every day. Special hymns composed in her honor, like the 'Ave, maris stella,' the 'Stabat Mater,' the 'Alma Redemptoris Mater,' and the English 'Daily, daily sing to Mary,' are frequently said or sung. At the end of every low Mass three Ave Marias and the 'Salve Regina,' as well as other prayers, are publicly recited in the vernacular by the priest and the congregation. The month of May is dedicated to Mary, and devotions in her honor are publicly conducted every day during that month. Every day in October the Rosary of the Blessed Virgin is publicly recited. Every Saturday in the year is specially dedicated to her. Sodalities established in her honor exist in every land. In all this the Church, following the teaching of the Fathers and the Councils and especially of the Council of Trent (1545–63), always carefully distinguishes between the adoration or supreme homage due to God alone and the reverence that may properly be shown to any of His creatures. Epiphanius long ago laid down the rule: "Let Mary be held in honor. Let the Father, Son, and Holy Ghost be adored, but let no one adore Mary (*τὴν Μαρίαν μηδεὶς προσκυνείτω*)." *Latria* is the name given to the adoration of God; *dulia* is the name given to the honor shown to the saints or to angels. As Mary is above all saints and angels — "Queen of angels" and "Queen of all saints" she is entitled in her Litany — the degree of veneration shown to her is called *hyperdulia*, which, while it is greater in degree than *dulia*, is infinitely below *latria* and differs in essence from it. Not every Catholic knows those words; but every Catholic, no matter how ignorant otherwise, feels and knows the distinction which they connote.

What Christian art owes to Mary it would be well nigh impossible to tell. Painters, sculptors, architects, musicians, and poets have outdone themselves in celebrating her praise. (See MADONNA IN ART). Shrines in her honor sprang up everywhere. In pre-Reformation England the country was studded with such shrines, the most celebrated being our Lady of Walsingham, in Norfolk. Among modern shrines the famous ones of the Holy House of Loreto in Italy, Einsiedeln in Switzerland, Lourdes in France, and Guadalupe in Mexico may be singled out for special mention.

It is of interest to note that, by decree of the Sixth Provincial Council of Baltimore (1846, confirmed 1847), the Blessed Virgin Mary, conceived without sin, was chosen as the patron of the United States of America.

Bibliography.— The amount of reading matter on this subject is, as might be expected, immense both in quantity and range. The following books may with advantage be consulted on the points with which they deal: Locrius, 'Maria augusta Virgo Deipara' (Atrebati 1608); Dudinck, 'Mundus Marianus' (Coloniæ 1644); Riccardi, 'Storia de' Santuarii più celebri di Maria Santissima sparsi nel mondo cristiano' (4 vols., Milano 1840–44); Newman, 'Development of Christian Doctrine' (London 1845); Passaglia, 'De immaculato Deiparæ semper Virginis conceptu . . . commentarius' (3 vols., Romæ 1854–55); Gousset, 'La Croyance générale et constante de l'Église touchant l'immaculée conception de la bienheureuse Vierge Marie' (Paris 1855); Pusey, 'Eirenicon' (Oxford 1865–69); Bourassé, 'Summa Aurea de Laudibus Beatæ Mariæ Virginis' (13 vols., Paris 1866 et seq.); 'Hymns to the Virgin and Child' (E. E. T. S., ed. Furnivall, 1867); Northcote, 'The Celebrated Sanctuaries of the Madonna' (London 1868); 'Mirror of Our Lady' (E. E. T. S. 1873); La Fuente, 'Vida de la Virgen María con la historia de su culto en España' (2 vols., Barcelona 1879); Waterton, 'Pietas Mariana Britannica' (London 1879); Jameson, 'Legends of the Madonna' (Boston 1881); Kurz, 'Mariologie' (Ratisbon

1881); Northcote, 'Mary in the Gospels' (London 1885); Lehner, 'Die Marienverehrung in den ersten Jahrhunderten' (2d ed., Stuttgart 1886); Bridgett, 'Our Lady's Dowry' (4th ed., London n.d.); Schaff, 'Creeds of Christendom' (New York 1890); Rudniki, 'Die berühmtesten Wallsfahrtsorte der Erde' (Paderborn 1891); Lee, 'The Sinless Conception of the Mother of God: a Theological Essay' (London 1891); Hurll, 'The Madonna in Art' (Boston 1897); Venturi, 'La Madonna' (Milan 1900); Pimentel, 'Historia do culto de Nossa Senhora em Portugal' (Lisbõa 1900); Terrien, 'La Mère de Dieu et la mère des hommes d'après les Pères et la théologie' (4 vols., Paris 1900-02); Ullathorne, 'The Immaculate Conception of the Mother of God' (2d ed., London 1904); Manresa, 'La Virgen Maria en la litteratura Hispaña' (Rome 1905); Kronenburg, 'Maria's Heerlijkheid in Nederland' (Amsterdam 1905-10); Neubert, 'Marie dans l'Église anténicéenne' (Paris 1908); Hartwell Jones, 'Celtic Britain and the Pilgrim Movement' (London 1912); Beissel, 'Wallfahrten zu unserer Lieben Frau in Legende und Geschichte' (Freiburg im Bresgau 1913); Pohle-Preuss, 'Mariology' (Saint Louis 1916).

The principal apocryphal writings relating to Mary are 'Evangelium Jacobi'; 'Liber de infantia Mariæ et Christi Salvatoris'; 'De nativitate Mariæ'; 'Evangelium Ps.—Matthaei'; 'Historia Josephi fabri lignarii'; 'Evangelium Mariæ'; *Ἰωάννου τοῦ θεολόγου λόγος εἰς τὴν κοίμησιν τῆς θεοτόκου*, 'Transitus Mariæ.'

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MARY I, queen of England, known popularly as "Bloody Queen Mary": b. London, 18 Feb. 1516; d. there, 17 Nov. 1558. She was a daughter of Henry VIII. After the death of her mother, Catharine of Aragon, she was declared illegitimate; but was restored to the succession in 1544. She was bred by her mother in the Roman Catholic faith, on which account she was treated with rigor under Edward VI. She ascended the throne 16 July 1553, after an abortive attempt to set her aside in favor of Lady Jane Grey (q.v.). One of her first measures was the reinstatement of the Roman Catholic prelates superseded in the late reign. Her marriage to Philip II of Spain, united as it was with a complete restoration of the Catholic worship, produced much discontent. Insurrections broke out under Cave in Devonshire, and Sir Thomas Wyatt in Kent, which although suppressed, formed sufficient excuses for the imprisonment of the Princess Elizabeth in the Tower and the execution of Lady Jane Grey and her husband, Lord Guilford Dudley. England was now formally declared to be reconciled to the Pope; the original laws against heretics were revived, and about 200 perished at the stake, including Cranmer, Latimer and Ridley (qq.v.). Under Philip's influence a war began with France, which ended in the loss of Calais in 1558, after it had been in the hands of the English for above 200 years. This disgrace told acutely upon Mary's already disordered health, and she died after a reign of five years. Consult the 'Life' by Strickland in 'Lives of the Queens of England' (new ed., 1864-65); Lingard, John, 'History of England' (6th ed., London 1855); Froude, 'History of England'; id., 'The Reign of Mary Tudor' (New York 1910); Stone, J., 'Mary I, Queen of England'; Mullinger, J. B., 'Philip and Mary' (in 'Cambridge Modern History,' Vol. II, Cambridge 1904); Hume, Martin, 'Two English Queens and Philip' (New York 1908).

MARY II, queen of England: b. London, 30 April 1662; d. there, 28 Dec. 1694. She was the daughter of James, Duke of York, afterward James II. She was married in 1677 to William, Prince of Orange, and when the Revolution was effected which dethroned her father, Mary was declared joint-possessor of the throne with her husband, King William, on whom the administration of the government devolved. During the absence of William in Ireland in 1690-91, Mary managed parties at home with extreme prudence, and acted with equal ability as regent in 1693 and 1694. She was strongly attached to the Protestant religion and the Church of England. She endowed William and Mary College, Virginia, originally intended for the training of missionaries. See WILLIAM III, and consult Burnet, Gilbert, 'Essay upon the Life of Queen Mary' (London 1695); Doebner, 'Memoirs and Letters of Mary II, Queen of England' (Leipzig 1886); Marshall, 'Kensington Palace in the Days of Queen Mary'; Morris, M., 'Reign of William and Mary' (New York 1910); Grew, E. and M. S., 'The Court of William III' (Boston 1910); Rait, R. S., 'Five Stuart Princesses' (ib. 1908).

MARY OF THE INCARNATION, French-Canadian Ursuline nun and educator: b. Tours, France, 1599; d. Quebec, 1672. Her maiden name was Guyard and in her 18th year she became the wife of M. Martin, but was left a widow with an infant son at 19. She eventually took the veil in the Ursuline Convent at Tours, and in 1639 went to Canada as superior of the convent established at Quebec by Madame de la Peltrie. She was extremely successful in administering the school for girls which the Ursulines opened, impressed all with her strong and beautiful personality, which was emphasized by her fine manners and tall stature, and she is one of the most stately and interesting figures in early Canadian history. She wrote an autobiography. Consult 'Lettres de la vénérable Mère Marie de l'Incarnation' (Paris 1681); Casgrain, 'Life of Mary of the Incarnation' (Montreal 1886); Charlevoix, 'La vie de la Mère Marie de l'Incarnation' (Paris 1724), and her son's life, 'La vie de la vénérable Mère Marie de l'Incarnation' (Paris 1677).

MARY MAGDALEN. See MAGDALEN; also MARY.

MARY STUART (MARY, QUEEN OF SCOTS), queen of Scotland: b. Linlithgow Palace, 8 Dec. 1542; d. 8 Feb. 1587 at Fotheringay Castle. The only child of James V of Scotland and Mary of Guise, she was proclaimed queen upon his death, 14 Dec. 1542, and was crowned 9 Sept. 1543 at Stirling Castle. Negotiations for her hand by the future Edward VI of England came to nothing in spite of the attempt to effect the betrothal by force of arms. In 1548, having been betrothed to the French Dauphin, she was sent to Paris, where 10 years

later she married the Dauphin, who died in 1560 soon after coming to the throne. Mary returned to Scotland, where her French Catholic training and the new Scottish Reformation made her position a hard one. She diplomatically yielded to the force of circumstances and surrounded herself with Protestant advisers. A match between the Scottish queen and Don Carlos of Spain, heir of Philip II, was all but arranged when Mary, in 1565, met Lord Darnley, her cousin, whom she married 29 July 1565. She had hoped to win by this marriage the English Catholics, with whom Darnley had great influence, and to unite all Catholic claims to the English throne, Darnley (see MARGARET TUDOR) being next in succession to Mary; but her husband's weak ambition made him the tool of the Protestant plot against Rizzio, an Italian favorite of the queen, who was killed 9 March 1566, being brutally dragged from Mary's dining-room. Three months later Mary gave birth to a son (later James I of England). She was temporarily reconciled to Darnley; but on 10 Feb. 1567, Darnley's house was blown up and he was killed. Mary had been in the house late the evening before, and the murder was laid to the Earl of Bothwell, whom Mary married 15 May 1567. This act turned all the nobles against her; she was forced to surrender to her enemies and on 24 July 1567 to abdicate the crown. She was imprisoned in Loch Leven Castle; escaped thence in May 1568; was unsuccessful in her attempt to raise an army; crossed into England, entrusting herself to Elizabeth; and was almost immediately imprisoned. Elizabeth wished to put Mary out of the way, seeing in her a dangerous rival for the English crown, but fear of France and Spain held her back until 1585, while Mary was imprisoned at Tutbury and entrapped into the Babington conspiracy against Elizabeth. Although her complicity was not clearly proved she was beheaded at Fotheringay. The moot point in Mary's tragic history is whether she was a party to Bothwell's assassination of Darnley. That she was is apparently proved by letters from her to Bothwell, which the Scottish nobles declared they found in Bothwell's jewel-case but the originals of these letters are not to be found, and their authenticity is doubtful. The matter is ably discussed in Cowan's 'Mary, Queen of Scots' (1901), and Lang's 'The Mystery of Mary Stuart' (1901). The point at issue is, however, confused by making it depend on the authenticity of these letters, for Mary's guilty knowledge of the plot against Darnley seems indubitable. But her career had more than a personal significance since in her person were combined the last hopes of Catholic rule in England and an intense devotion to Catholicism. Personally she was of a dazzling complexion, apparently her main claim to beauty, marvelously winning, as her early career shows, and clever in argument, as was evidenced nowhere more plainly than in her trial for treason.

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MARYBOROUGH. (1) An Australian town in Talbot County, Victoria, about 100 miles north of Melbourne. It contains several factories, machine works and gold mines. Its railroads are of considerable importance on account of its central geographical position. Pop. 5,675. (2) Another Australian town in March County, Queensland, about 180 miles north of Brisbane. It is also a railroad centre and a gold mining region. The other industries are timber, coal, sugar and sugar refineries, foundries, boot and shoe factories, soap works, saw mills, fisheries, ship yards, etc. Pop. 11,626.

MARYLAND, one of the 13 original States, was seventh to ratify the United States Constitution (25 April 1788). Situated on the Atlantic Coast, it extends from lat. 37° 53′ to 39° 43′ N. and from long. 75° 4′ to 79° 33′ W. It is bounded on the north by Pennsylvania and Delaware, on the east by Delaware and the Atlantic Ocean, on the south by Virginia and West Virginia and on the west by West Virginia. The entire course of the Potomac River lies in Maryland. The extreme length of the State from east to west is 240 miles and its extreme width from north to south is 125 miles. At its narrowest point near Hancock, the width is only about three miles. The State's shape is roughly that of two triangles meeting at this narrow point. The total area is 12,210 square miles, of which 2,350 square miles are covered by water, leaving 9,880 square miles of land. Annapolis is the capital and Baltimore is the chief commercial, financial and industrial centre. The State is subdivided into 23 counties, in addition to Baltimore city. For polling purposes the counties are subdivided into election districts, and there are about 100 incorporated municipalities, the largest of which are Cumberland, Hagerstown and Frederick.

Topography.— Maryland possesses great variety of physiographic features. The State is divided by the Chesapeake Bay into two parts, known as the Eastern and Western Shores. The Eastern Shore is the smaller division and is a level region, forming a part of the Coastal Plain, the land rising toward the north, in Cecil County, to the height of about 100 feet, while in Worcester County, at the south, the highest elevation is only about 25 feet. The land is broken by rivers which are navigable, as far as tidewater extends, for they are really tidal estuaries, rather than rivers.

MARYLAND.

Estimated population, 1,362,807

COUNTIES

Pop.			Pop.		
62,411	Allegany	A 1	27,965	Harford	B 18
39,553	Anne Arundel	E 15	16,106	Howard	E 13
747,349	Baltimore	C 15	16,957	Kent	E 20
700,000	Baltimore City	D 16	32,089	Montgomery	E 11
10,325	Calvert	J 16	36,147	Prince George	H 14
19,216	Caroline	G 22	16,839	Queen Anne	F 20
33,934	Carroll	A 12	26,455	Somerset	M 23
23,759	Cecil	B 21	17,030	St Marys	L 15
16,386	Charles	J 13	19,620	Talbot	I 20
28,669	Dorchester	K 20	49,617	Washington	A 7
52,673	Frederick	D 9	26,815	Wicomico	L 23
20,105	Garrett	K 2	21,841	Worcester	M 26

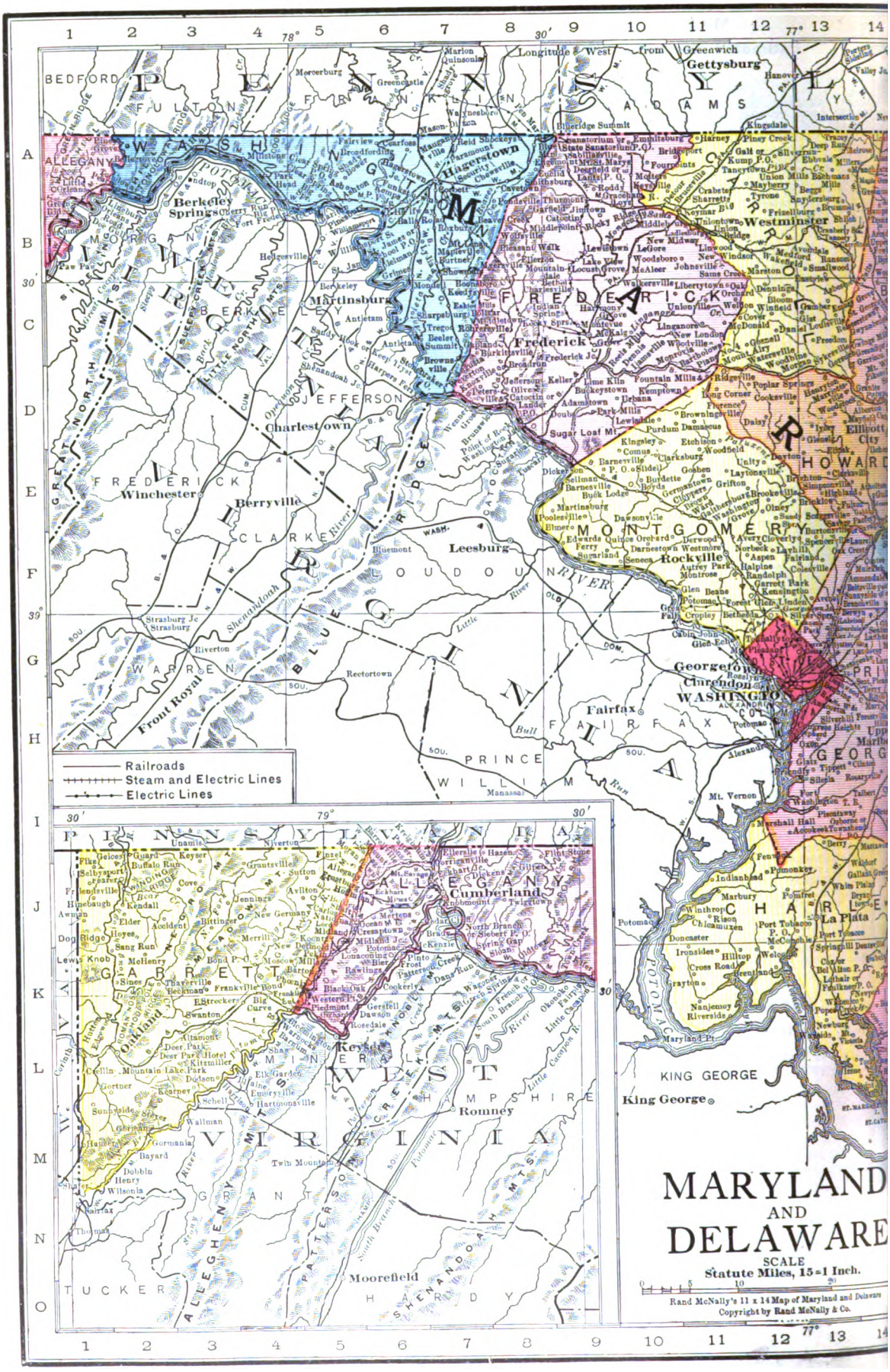
Incorporated Cities, Towns, and Villages

616	Aberdeen	B 19	269	La Plata	J 13
8,760	Annapolis	G 17	2,415	Laurel	F 14
9	Arundel-on-the-Bay,	G 17	133	Laytonsville	E 12
			526	Leonardtown	L 15
*700,000	Baltimore	D 16	216	Loch Lynn Heights, Garrett	K 2
1,005	Belair	B 18			
1,317	Berlin	L 27	1,553	Lonaconing, Allegany	K 6
308	Betterton	D 20			
262	Bishopville	K 28	523	Manchester	A 13
460	Bladensburg, Prince George	H 14	692	Middletown	C 8
			1,173	Midland	J 5
372	Bloomington	L 5	399	Millington	D 22
759	Boonsboro	C 7	335	Mountain Lake Park	L 2
19	Bridgetown				
835	Brookeville	E 12	622	Mt. Airy	D 11
3,721	Brunswick	D 8	1,242	Mount Rainier, Prince George	H 14
228	Burkittsville, Frederick	C 8	320	New Market, Frederick	D 9
6,407	Cambridge	J 20			
518	Cecilton	C 22	446	New Windsor	B 12
1,435	Centerville	F 20	974	North East	B 21
274	Charlestown	B 21	1,366	Oakland	L 2
1,016	Chesapeake City	B 22	476	Ocean City	L 28
2,735	Chestertown	E 20	1,191	Oxford	I 19
306	Church Hill	E 21	635	Perryville	B 20
521	Clear Spring	A 5	73	Piscataway	I 13
3,468	Crisfield	O 22	300	Pittsville	K 25
228	Crumpton	E 21	2,369	Pocomoke City	N 24
26,074	Cumberland	J 7			
170	Damascus		476	Point of Rocks	D 8
988	Deer Park	L 2	175	Poolesville	E 9
959	Delmar		1,394	Port Deposit	B 20
1,481	Denton	G 22	288	Preston	I 21
280	East New Market	J 21	1,006	Princess Anne	M 23
3,083	Easton	H 20	279	Queenstown	G 19
2,487	Elkton	B 22	943	Ridgely	G 21
1,151	Ellicott City	D 14	416	Rising Sun	A 20
1,054	Emmitsburg	A 11	781	Rock Hall	E 19
1,050	Federalsburg	I 22	1,181	Rockville	E 11
11,112	Frederick	C 19	6,690	Salisbury	L 24
466	Friendsville	J 1	409	Secretary	J 21
6,028	Frostburg	J 5	960	Sharpsburg	C 6
568	Funkstown	B 7	722	Sharptown	J 23
625	Gaithersburg	E 11	481	Smithsburg	A 8
262	Galena	D 21	1,844	Snow Hill	M 25
185	Garrett Park	F 12	1,517	St. Michaels	H 19
325	Girdletree	N 25	318	Solomans	L 17
203	Glen Echo	G 11	173	Somerset, Montgomery	E 11
201	Goldsboro	F 22			
248	Grantsville	J 4	247	Sudlersville	E 22
609	Greensboro	G 22	565	Sykesville	D 13
25,679	Hagerstown	A 7	1,242	Tacoma Park	G 13
555	Hampstead	B 14	824	Taneytown	A 11
893	Hancock	A 3	903	Thurmont	B 19
4,212	Havre de Grace	B 20	273	Trappe	I 19
209	Hillsboro	G 21	804	Union Bridge	B 12
516	Hurlock	I 22	361	Upper Marlboro	H 14
98	Hyattstown, Montgomery	D 10	332	Vienna	K 22
			582	Walkersville	C 10
1,917	Hyattsville	G 14	2,702	Westernport	K 6
367	Keedysville	C 7	3,295	Westminster	B 13
689	Kensington	F 12	1,571	Williamsport	B 6
865	Kitzmiller	L 4	362	Woodsboro	B 10

DISTRICT OF COLUMBIA

Estimated population, 363,980

353,378	The District	G 12	363,980	Washington	H 12
16,046	Georgetown	G 11			


MARYLAND
AND
DELAWARE
SCALE
Statute Miles, 15=1 Inch.
Rand McNally's 11 x 14 Map of Maryland and Delaware
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Railroads
Steam and Electric Lines
Electric Lines
PENNSYLVANIA
WEST VIRGINIA
VIRGINIA
DELAWARE
BEDFORD
FULTON
FRANKLIN
ADAMS
ALLEGANY
WASHINGTON
MARYLAND
FREDERICK
CARROLL
MORGAN
BERKELEY
JEFFERSON
CLARKE
LOUDOUN
FAIRFAX
PRINCE WILLIAM
MONTGOMERY
HOWARD
CHARLES
GARRETT
MINERAL
HAMPSHIRE
HARDY
GRANT
TUCKER
Gettysburg
Hagerstown
Frederick
Westminster
Berkeley Springs
Martinsburg
Charlestown
Winchester
Berryville
Leesburg
Rockville
Georgetown
Clarendon
WASHINGTON
Fairfax
Mt. Vernon
Cumberland
Keyser
Romney
Moorefield
Oakland
Ellicott City
La Plata
Port Tobacco
Upper Marlboro
Marbury
Indianhead
Pomonkey
Doncaster
Nanjemoy
Riverside
Maryland Pt.
KING GEORGE
King George
Front Royal
Strasburg
Riverton
Rectortown
Manassas
Sugar Loaf Mt.
Twin Mountain
Potomac
Shenandoah
Monocacy
Patuxent
Bull Run
Little Cacapon
Great North Mts.
Little North Mts.
Blue Ridge
Allegheny Mts.
Patterson Creek Mts.
Shenandoah Mts.
Longitude West from Greenwich
78°
77°
79°
30'
39°
A
B
C
D
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F
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14

LANCASTER
CHESTER
GLOUCESTER
NEW JERSEY
HARFORD
BALTIMORE
Towson
Bel Air
Baltimore
CECIL
KENT
QUEEN ANNES
CUMBERLAND
Bridgeton
Salem
Vineland
Chestertown
Centerville
DELAWARE
DOVER
Smyrna
Milford
Georgetown
SUSSEX
ANNE ARUNDEL
ANNAPOLIS
Annapolis
Baltimore
Easton
Cambridge
Denton
Prince Frederick
Leonardtown
DORCHESTER
SOMERSET
WICOMICO
WORCESTER
Salisbury
Princess Anne
Snow Hill
Ocean City
Delmar
Seaford
Laurel
Millsboro
Rehoboth Bay
Indian River Bay
Indian River Inlet
Chincoteague Bay
Assawoman Bay
Isle of Wight Bay
Sinepuxent Bay
Newport Bay
Pocomoke Sound
Tangier Sound
Kedges Straits
Smith Island
Hooper Island
Deal Island
Bloodsworth I.
Tilghman I.
Hart I.
Miller I.
Sharps I.
Barren I.
Taylor I.
Adam I.
Long I.
Holland I.
Little I.
Sandy I.
Watkins Pt.
Point Lookout
Cornfield Harbor
Rhodes Point
Crisfield
Somers Cove
Marumsco
Shelltown
Hopewell
Tulls Corner
Marion Sta.
Rehoboth
Dagsboro
Frankford
Bethany Beach
Fenwick I.
Ocean City
Assateague I.
Chincoteague
Wallops I.
Cape Henlopen
Egg Island Pt.
Deep Water Pt.
Bombay Hook Island
Delaware River
Delaware Bay
Atlantic Ocean
Susquehanna River
Patapsco River
Choptank River
Nanticoke River
Wicomico River
Pocomoke River
Elk River
Sassafras River
Chester River
Magothy River
Severn River
Gunpowder River
Bush River
Back River
Middle River
Patuxent River
Potomac River
Anacostia River
Rock Creek
Broad Creek
Broadkill R.
Mispillion R.
Cedar Creek
Murderkill R.
St. Jones R.
Leipsic R.
Duck Creek
Smyrna R.
Appoquinimink R.
Christina R.
Brandywine Cr.
White Clay Cr.
Red Clay Cr.
Christiana
Wilmington
Newark
New Castle
Middletown
Odessa
Townsend
Port Penn
Delaware City
Port Deposit
Perryville
Havre de Grace
Aberdeen
Edgewood
Joppa
Towson
Catonsville
Ellicott City
Laurel
Bowie
Upper Marlboro
Hyattsville
Riverdale
Greenbelt
Beltsville
Silver Spring
Takoma Park
Rockville
Gaithersburg
Germantown
Clarksburg
Frederick
Hagerstown
Boonsboro
Middletown
Myersville
Brunswick
Point of Rocks
Sugarloaf Mt.
Catoctin Mt.
South Mt.
Blue Ridge Mts.
Allegheny Mts.
Piedmont Plateau
Coastal Plain
Appalachian Mts.
Cumberland
Frostburg
Westernport
Oakland
Deep Creek Lake
Youghiogheny R.
Savage R.
Potomac R.
Cumberland Gap
Harpers Ferry
Shenandoah R.
Shenandoah Valley
Great Valley
Hagerstown Valley
Piedmont Valley
Susquehanna Valley
Eastern Shore
Western Shore
Chesapeake Bay
Chesapeake and Delaware Canal
Chesapeake and Ohio Canal
Pennsylvania
Maryland
Virginia
West Virginia
New Jersey
Delaware
District of Columbia
Atlantic Ocean
Gulf Stream
Continental Shelf
Continental Slope
Abyssal Plain
Mid-Atlantic Ridge
Bermuda
Azores
Canary Islands
Cape Verde Islands
Madeira Islands
Gibraltar
Strait of Gibraltar
Mediterranean Sea
Europe
Africa
North America
South America
Asia
Australia
Pacific Ocean
Indian Ocean
Arctic Ocean
Antarctica
Equator
Tropic of Cancer
Tropic of Capricorn
Prime Meridian
International Date Line
North Pole
South Pole
Greenwich
London
Paris
Berlin
Moscow
Rome
Madrid
Lisbon
Dublin
Edinburgh
Oslo
Stockholm
Helsinki
Warsaw
Vienna
Budapest
Prague
Athens
Istanbul
Cairo
Alexandria
Tripoli
Algiers
Tunis
Casablanca
Dakar
Lagos
Nairobi
Johannesburg
Cape Town
Perth
Sydney
Melbourne
Brisbane
Auckland
Wellington
Tokyo
Osaka
Kyoto
Nagoya
Yokohama
Kobe
Hiroshima
Nagasaki
Sapporo
Fukuoka
Seoul
Busan
Pyongyang
Beijing
Shanghai
Tianjin
Guangzhou
Shenzhen
Hong Kong
Taipei
Kaohsiung
Manila
Cebu
Davao
Jakarta
Surabaya
Bandung
Medan
Palembang
Semarang
Makassar
Bali
Singapore
Kuala Lumpur
Penang
Johor Bahru
Bangkok
Chiang Mai
Phuket
Pattaya
Hat Yai
Ho Chi Minh City
Hanoi
Haiphong
Da Nang
Nha Trang
Vung Tau
Phnom Penh
Siem Reap
Vientiane
Luang Prabang
Yangon
Mandalay
Naypyidaw
Dhaka
Chittagong
Kolkata
Mumbai
Delhi
Bangalore
Chennai
Hyderabad
Ahmedabad
Pune
Surat
Jaipur
Lucknow
Kanpur
Nagpur
Indore
Thane
Bhopal
Visakhapatnam
Pimpri-Chinchwad
Patna
Vadodara
Ghaziabad
Ludhiana
Agra
Nashik
Faridabad
Meerut
Rajkot
Kalyan-Dombivli
Vasai-Virar
Varanasi
Srinagar
Aurangabad
Dhanbad
Amritsar
Navi Mumbai
Allahabad
Howrah
Ranchi
Gwalior
Jabalpur
Coimbatore
Vijayawada
Jodhpur
Madurai
Raipur
Kota
Guwahati
Chandigarh
Solapur
Hubli-Dharwad
Bareilly
Moradabad
Mysore
Gurgaon
Aligarh
Jalandhar
Tiruchirappalli
Bhubaneswar
Salem
Mira-Bhayandar
Warangal
Thiruvananthapuram
Guntur
Bhiwandi
Saharanpur
Gorakhpur
Bikaner
Amravati
Noida
Jamshedpur
Bhilai
Cuttack
Firozabad
Kochi
Nellore
Bhavnagar
Dehradun
Durgapur
Asansol
Nanded
Kolhapur
Ajmer
Gulbarga
Jamnagar
Ujjain
Loni
Siliguri
Jhansi
Ulhasnagar
Jammu
Sangli-Miraj & Kupwad
Mangalore
Erode
Belgaum
Kurnool
Ambattur
Tirunelveli
Malegaon
Gaya
Jalgaon
Udaipur
Maheshtala
Tirupur
Davanagere
Kozhikode
Akola
Kurnool
Rajpur Sonarpur
Bokaro
Rajahmundry
Ballari
Agartala
Bhagalpur
Latur
Dhule
Korba
Bhilwara
Brahmapur
Muzaffarpur
Ahmednagar
Mathura
Kollam
Avadi
Kadapa
Kamarhati
Bilaspur
Shahjahanpur
Thrissur
Alwar
Bharatpur
Sagar
Ratlam
Raichur
Modinagar
Rourkela
Panihati
Nizamabad
Parbhani
Tumkur
Hisar
Ozhukarai
Bihar Sharif
Panipat
Darbhanga
Kochi
Nellore
Bhavnagar
Dehradun
Durgapur
Asansol
Nanded
Kolhapur
Ajmer
Gulbarga
Jamnagar
Ujjain
Loni
Siliguri
Jhansi
Ulhasnagar
Jammu
Sangli-Miraj & Kupwad
Mangalore
Erode
Belgaum
Kurnool
Ambattur
Tirunelveli
Malegaon
Gaya
Jalgaon
Udaipur
Maheshtala
Tirupur
Davanagere
Kozhikode
Akola
Kurnool
Rajpur Sonarpur
Bokaro
Rajahmundry
Ballari
Agartala
Bhagalpur
Latur
Dhule
Korba
Bhilwara
Brahmapur
Muzaffarpur
Ahmednagar
Mathura
Kollam
Avadi
Kadapa
Kamarhati
Bilaspur
Shahjahanpur
Thrissur
Alwar
Bharatpur
Sagar
Ratlam
Raichur
Modinagar
Rourkela
Panihati
Nizamabad
Parbhani
Tumkur
Hisar
Ozhukarai
Bihar Sharif
Panipat
Darbhanga

Steamboats ply upon some of these streams, such as the Elk, the Sassafras, the Chester, the Choptank, the Nanticoke, the Wicomico and the Pocomoke, and the rivers frequently serve as county boundaries.

At the head of the Chesapeake Bay, the Susquehanna River enters it, after draining a large section of New York and Pennsylvania; but owing to rapids, the stream is not navigable. The counties bordering upon the western shore of the bay are also for the most part in the Coastal Plain and have similar characteristics to those of the Eastern Shore, although the river banks are higher and often comprise "cliffs" of earth, and the land is of slightly greater elevation and is more rolling. The average elevation is about 125 feet. The bay exercises a genial influence upon the climate of the surrounding region. The winters are usually neither long nor severe. The part of the State lying between the bay and the Potomac River is known as southern Maryland. The Western Shore is also divided by rivers: the Gunpowder, the Patapsco, the Magothy, the South, the Patuxent and the Potomac. These rivers differ from those of the Eastern Shore only in that most of their upper courses run into hilly country. The soil on both sides of the bay is either sandy or a light loam, which is favorable to the production of cereals and tobacco, and in which all kinds of fruits and vegetables thrive.

From the Coastal Plain the land rises into the Piedmont region to a height of from 300 to 700 feet toward the Blue Ridge. This Piedmont region is undulating in its surface and is well watered by streams which provide considerable water power. Some of these streams empty into the bay, such as the Gunpowder, the Patapsco, the Patuxent; and some are tributaries of the Potomac, such as the Monocacy, the Great Pipe Creek, the Antietam and the Conococheague. Some of the smaller streams, such as Jones' Falls, were called Falls by the early settlers, because of their rapid descent from the uplands. Several ridges, with an elevation of about 800 feet, cross this section, the most important of these being Parr's Ridge, and they divide the country into valleys which are rich and fertile. Beyond the Blue Ridge, the western part of Maryland forms a part of the Appalachian Mountain region, and is traversed by the Allegheny Mountains in Allegany and Garrett counties. Some of the peaks of the Blue Ridge are from 2,000 to 2,400 feet high, and the summits of the Alleghanies vary from 1,500 to 3,500 feet above sea-level. The highest point in the State is Backbone Mountain in Garrett County.

The mean temperature for eastern Maryland for spring is 51.7° F.; for summer, 74.5° F.; for autumn, 55.8° F; for winter, 36.1° F.; for the year, 54.5° F.; for southern Maryland, 53.1°; 75.5°; 57.2°; 36.9°; 55.6°; for northern central Maryland, 50.6°; 73.6°; 54.3°; 33.1°; 53°; for western Maryland, 49.4°; 72.7°; 52.7°; 31.7°; 52°.

Geology.— Maryland displays a remarkably complete sequence of all the geological foundations. The most ancient rocks are here to be found, as well as those still in the process of deposition, and, between these wide limits, almost every important geological epoch is represented. In the Coastal Plain, a predominance of tertiary foundations is found on the Eastern Shore, and, of Mesozoic and Tertiary beds, on the Western Shore. There are few rocks, the country being overlaid with deposits of sand and gravel. In the Piedmont region, on the eastern side of Parr's Ridge (its central watershed), there is a sequence of highly crystalline rocks, in large part, igneous in their origin. On the western side of the ridge, the rocks are only partly crystalline and represent the early Paleozoic time. The rocks of the Frederick Valley are composed of blue Paleozoic limestone, in part overlaid by red sandstone. The Blue Ridge is made up of Cambrian and Lower Silurian beds, in places so eroded and displaced as to disclose the Archæan floor upon which they rest. The Appalachians proper are made up of sharply folded Upper Silurian and Devonian strata, and the Allegheny Plateau is mainly composed of late Devonian and Carboniferous deposits, containing the coal seams of the Cumberland Basin.

Mineral Resources.— Maryland is rich in mineral resources. Iron ore is extensively distributed throughout the Western Shore and in the northern part of the Eastern Shore, and is of good quality for casting and other purposes. The iron industry is of early origin. Forges and furnaces were in operation in the province as early as 1649, and the industry continued, until a recent date, to be an important factor in the prosperity of the State. Most of the old furnaces now have been extinguished, being unable to compete with the great iron and steel plants, using ores produced in foreign countries or in distant parts of the United States. The seat of the steel industry of the State is at Sparrow's Point, in the great works begun in 1887, where Cuban ores are chiefly used, mixed with those from Spain and Algeria. The first Bessemer steel ever produced in Maryland was made there 1 Aug. 1891.

The coal deposits of Maryland belong to the Allegheny field and are semi-bituminous, superior to any other for generating steam. The portion of this field lying in Maryland is of comparatively small size, but constitutes by far the most important of the State's mineral resources. It is called the Cumberland, Frostburg or George's Creek Basin. Situated in an elevated trough, west of the city of Cumberland, and between Dan's and Savage mountains, it is about 20 miles long and 4 miles wide. The principal coal bed is known as the Big, or 14-foot, Vein, and has been the chief one worked. Nearly 100,000,000 tons of coal have been shipped from this vein. The coal contains from 72 to 83 per cent of carbon, and its discovery, about 1804, gave a strong stimulus to the movement for the construction of the Chesapeake and Ohio Canal and the Baltimore and Ohio Railroad.

Three veins of copper are found in Maryland and, before the opening of the Western copper mines, they made it a copper-producing State. Chrome deposits were discovered in Baltimore County in 1827 and have been extensively worked. Some gold has been mined in Montgomery County.

Extensive areas of granite have been quarried for building stone, especially at Port Deposit, in Cecil County; near Woodstock in Baltimore County (much used in the public buildings in Washington city); and near Ellicott

unty. Gneiss has been quar-
County. The sandstone
of Seneca Creek in Mont-
important and their prod-
much used in Washington city.
best-known districts in the United
for the production of roofing slate is
Peach Bottom region in Harford County,
near the Pennsylvania line. These slates were worked as early as the American Revolution. The most valuable limestone deposits are the highly crystalline marbles at Baltimore County, lying in a bed extending from Lake Roland through Texas to Cockeysville. These quarries produce the white steps for which the Baltimore houses are noted. The Washington Monument in the District of Columbia was built of stone from the Cockeysville quarries. Some of the Maryland marbles have decorative possibilities, and the «Potomac marble» or «Calico rock» of Frederick County is used in the old House of Representatives in the National Capitol. Maryland limestone is used as flux for blast furnaces and is largely quarried and burnt to produce quick lime for commercial and agricultural purposes.

Hydraulic cement is manufactured near Cumberland and Hagerstown, and at Union Bridge, in Carroll County. Serpentine stones are quarried on Broad Creek in Harford County. Clays constitute an important feature of the economic geology of Maryland and are used in the manufacture of building brick, terra cotta and tile work, fire brick and pottery. The workable areas of clay suitable for building brick cover a large area of the State, and the Baltimore pressed bricks have been very extensively used. In Harford County there are produced large quantities of flint, which is used in the manufacture of porcelain. Kaolin and feldspar of fine quality are found in Cecil County, and glass sand is used from Anne Arundel County.

Agriculture.— In the provincial period, after a few years in which the fur trade was important, agriculture became the principal employment of the people. The settlers lived on large plantations along the shores of the Chesapeake and its tributary streams and cultivated tobacco, with the assistance of indentured white servants and later with negro slaves. There was an active demand for the staple crop in European markets, and an extensive commerce resulted, which brought wealth to the planters. Tobacco became the currency of the province, and, for a long time, debts and public dues were paid therein. In the early 18th century, the cultivation of grain gradually supplanted that of tobacco, on the Eastern Shore, and, since that time, tobacco growing lands have been limited to the southern part of the Western Shore below the Severn River. For about 175 years there has been a State inspection of tobacco, and the hogsheads containing it are brought to large State warehouses in Baltimore. Indian corn, or maize, was grown by the aborigines and has always been largely produced in the State. Wheat finds a congenial soil and climate, and the grain trade of Baltimore has long been great. The fertile soils of Frederick, Carroll and Washington counties contain some of the best farming land in the United States, and large quantities of grain are also grown in Queen Anne's County on the Eastern Shore.

The sandy soil of Anne Arundel County is well adapted to early vegetables and to small fruits, such as strawberries. Large quantities of tomatoes are grown there, as also in Frederick and Harford counties. The neighborhood of Baltimore and Washington city has caused large numbers of men to raise vegetables for market in Prince George's, Montgomery, Anne Arundel, Baltimore and Harford counties. Dairy farming is also widely practised in Carroll, Baltimore, Harford and Montgomery counties. There is very little vacant land in the State, except some in the swamps of Dorchester County or in the mountains of Garrett County. The value of farm land has considerably increased of recent years on account of greater accessibility to markets, and runs now from $20 to $150 per acre. The unoccupied land belongs to the State, which maintains a land office in Annapolis.

There is an important trade from the Eastern Shore in sweet potatoes, melons and small fruits, to the markets of Baltimore, Philadelphia and New York. For nearly 50 years large orchards of peaches have been grown on the Eastern Shore and in southern Maryland, and there are now considerable areas of ground in Carroll, Frederick and Washington counties devoted to similar orchards; while many apple orchards have been planted along the mountain sides in the two latter counties. In 1910 there were 48,719 farms in Maryland, of which 33,408 were cultivated by their owners. The value of the buildings was $72,751,000, of the farm animals, $30,649,961, of the grain crops of that year, $21,918,730, of the fruits and vegetables then raised, $15,195,629.

Forestry.— The forest trees are principally pine, chestnut, oak (in three varieties, white, black and red), hickory and walnut. A deadly blight has destroyed a large part of the chestnut trees in the past few years. A State department of forestry was organized in 1906, and has done much toward producing proper methods of forest management throughout the State. The trade in lumber for pipe staves was one of the very first industries of the province.

Game and Fisheries.—The Allegheny Mountains still contain deer; wild geese and ducks may be found on the bay; woodcock, grouse and partridges exist in considerable number. The waters of the Chesapeake Bay and its tributaries abound in fish, crabs and oysters, and terrapin were formerly commonly found. The annual value of the food produced by these waters is very great. Oysters, both fresh and canned, and fish are sent to other States, and Crisfield in Somerset County is one of the greatest crab markets in the world. Of recent years, the State has paid especial attention to the conservation of life in the waters, and has encouraged the cultivation of oysters.

Manufactures.— The first manufactures in Maryland, outside of the products of household industry, were those of iron, and the Principio Furnace in Cecil County has been in operation for over 150 years. The country adjacent to the Chesapeake possesses neither coal nor water power. The central portion of the State is well provided with water power, and the far western portion with coal. Maryland enjoys a strategic position from her nearness also to the sources of production of raw material. From her great facilities in water carriage, and from her good

railroad connection with every part of the continent, she possesses a very favorable position in regard to manufactures. The factories are mostly established in Baltimore, Cumberland, Hagerstown and Frederick, and in the vicinity of these cities. Large quantities of flour are ground in mills along the Patapsco River, and in Frederick and Carroll counties, and there is much canning of oysters and fish, fruit and vegetables, in Baltimore, and, indeed, throughout the State. Textile fabrics, especially cotton duck, are manufactured near Baltimore, and ready-made clothing is extensively made in that city. Bricks, lumber, straw hats, shoes, shirts, cement, copper manufactures, glass, etc., are manufactured there. Large quantities of munitions of war have recently been made in Baltimore, in establishments which had previously made articles of iron and steel for peaceful purposes. Cigars, smoking tobacco, chewing gum and snuff are also largely manufactured in that city. The Bromo Seltzer Company and the Crown Cork and Seal Company have large factories in Baltimore. This city is the leading market of the South for the manufacture and distribution of fertilizers, of drugs and of chemicals. Large breweries and potteries are also located there.

Ship-building.— The Marylanders of provincial times built small sailing vessels, the most interesting types of which were the bugeye and five log canoes, which are still used in the oyster trade on the Chesapeake. After Baltimore was founded, it became a centre of ship-building, and the clipper ships which came from its shipyards were famous around the world for their beauty and speed. They carried on trade with South America, and made voyages to the Pacific, as well as to Europe. When steel ships succeeded wooden, there was established by the Pennsylvania Steel Company, about 1888, an important ship-building plant at Sparrow's Point, near the mouth of the Patapsco River, 12 miles below Baltimore. This plant has recently been bought by the Bethlehem Steel Company, and has been very much enlarged during the Great War. Another important ship-building corporation is the Baltimore Dry Dock Company, located at Baltimore, on Whetstone Point near Fort McHenry. There are several lesser shipyards, and the output of Baltimore in the way of ships is quite important.

Communication.— The Baltimore and Ohio Railroad,— the oldest one in America,— was chartered in 1827, and is still operated under its original charter. In 1830, the first locomotive in the United States was run over this road between Baltimore and Ellicott City. Originally intended to extend to the Ohio River, it now runs to Philadelphia, to Chicago and to Saint Louis. A branch line runs from Cumberland to Pittsburgh. The Philadelphia, Wilmington and Baltimore Railroad, chartered in 1836, and the Baltimore and Potomac Railroad, chartered in 1853, now form part of the Pennsylvania Railroad, as do the Northern Central, running from Baltimore through Harrisburg to Rochester, which was chartered in 1854, and the Frederick and Pennsylvania Line Railroad, chartered in 1867. Another series of branches of the Pennsylvania system permeate the Eastern Shore. A third important railroad, the Western Maryland, was chartered in 1852, and now runs from Baltimore to Hagerstown, to Cumberland, whence it goes by two branches into West Virginia and to Pittsburgh. The Maryland and Pennsylvania Railroad runs from Baltimore to Delta. Electric roads lead from Baltimore to Washington and to Annapolis, and another electric road runs from Frederick to Hagerstown, and also to Thurmont. The city of Baltimore has an extensive trolley system, which also serves the suburbs. The first electric railway in the United States, was constructed in Baltimore in 1885. Horse cars had been introduced there in 1860, and they were superseded by cable cars (beginning in 1889), and trolley cars beginning in 1892. James Rumsey made experiments in the propulsion of boats by steam, in the latter part of the 18th century, upon the Potomac River. The bay and its rivers were the first highways, and several lines of steamboats run from Baltimore to the heads of navigation of these rivers, while ocean-going vessels ply regularly, northward and southward, along the coast and to foreign lands. In 1844 the first line of telegraph constructed in the world was operated between Baltimore and Washington, and telegraph and telephone lines now reach every part of the State. The roads were poor unt'l about 1800, when an era set in of very considerable construction of macadamized turnpike in the western part of the State. Most of the turnpikes have now become part of an excellent system of State roads constructed between 1905 and 1915, which links together every county in Maryland. The desire for the improvement of the Potomac River, so as to render it navigable, a project in which George Washington took great interest, led to the beginning of the Chesapeake and Ohio Canal in 1826. Designed to cross the Allegheny Mountains, it was never completed further than from Georgetown, D. C., to Cumberland, and it is now chiefly used for the transportation of coal from the mines to tidewater. A canal along the Susquehanna has long been abandoned, but one for ships across the Eastern Shore, extending from the head of the Elk River to the Delaware River, is still used by daily trips of steamboats from Baltimore to Philadelphia, and is expected soon under Federal ownership to be much increased in draft.

Commerce.— Baltimore is practically the only port of entry in the State. In 1916 the imports of merchandise at this port were valued at $8,414,193 of dutiable articles and at $30,527,473 of articles free of duty, and in 1917 at $7,958,139 of dutiable articles and at $29,005,646 of articles free of duty. The greatest value of any article imported on the free list was manganese ore ($6,910,396), next came wood pulp ($6,834,157), nitrate of soda ($3,180,545), pig iron ($2,192,609), crude mineral oil ($1,887,734), copper ($1,716,672), iron ore ($1,392,559). Molasses came first among dutiable articles, with a value of $2,957,060; corks second, with a value of $923,128. The total value of exports for 1917 was $377,623,300, compared with $290,312,216 for 1916, an increase of more than 30 per cent. Copper stood first among exports in 1917, with a value of $84,341,482, and was followed by iron and steel ($73,790,708), wheat ($45,806,823), Indian corn ($22,047,886), flour ($19,532,954), raw cotton ($17,696,807), rye ($15,961,340), oats

($14,407,329), brass ($14,093,614), tobacco ($12,113,711), chemicals ($9,094,384). During 1917, Canadian articles (valued at $12,992,-021) were exported from Baltimore, in transit, the chief articles being wheat ($10,903,879), oats ($893,871) and wheat flour ($686,465). The city has an important coastwise trade.

State Finances.— The gross amount of the State's debt is $27,448,880, and after deducting productive stocks and the sinking fund, the net debt amounts to $18,655,983. The total assessed value of property in 1916 was $1,182,-456,531, of which the valuation of Baltimore city property amounts to $646,493,644 and that of the counties to $535,962,867. The city pays 54.67 per cent of the direct State taxes. The real estate in the counties is assessed at $422,-292,436. The State tax rate in 1910 is 36¼ cents on each $100, and the tax is chiefly levied to pay for the public schools and for the State debt. The tax rate in Baltimore city is usually in the neighborhood of $2 per $100 of valuation, and the assessment is little below the full value of property. Tax rates in the counties vary from about $0.90 to $1.40, and in the municipalities, from $0.50 to $1.28.

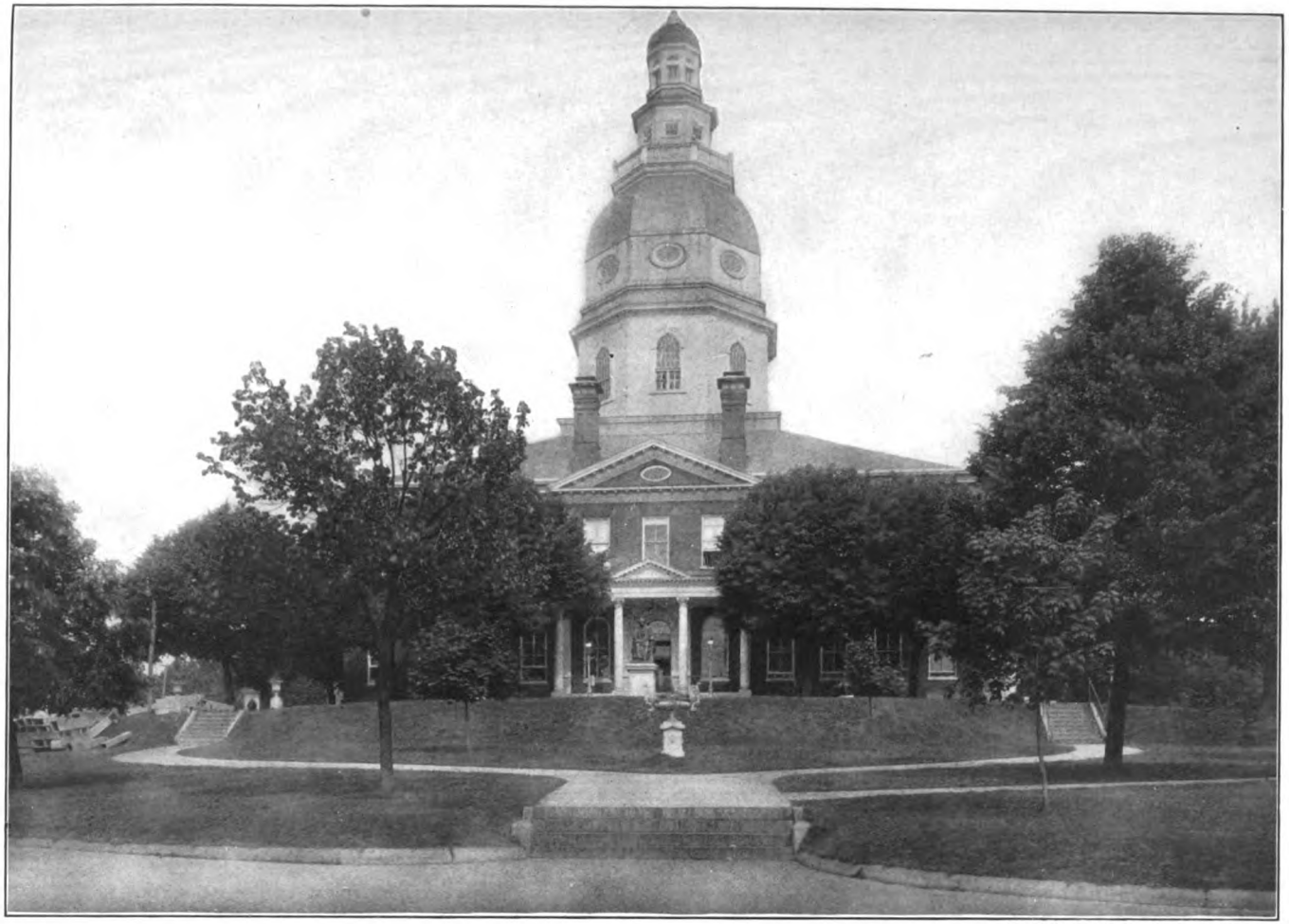
The receipts of the State for the fiscal year ending 30 Sept. 1917, amounted to $11,676,471, and the balance in the treasury at the beginning of the year was $1,624,095. The disbursements for the year were $11,450,622, leaving a balance of $1,849,904. To this should be added a balance in funds account of $423,715, and deducted on account of dedicated funds, $1,633,-200, leaving $640,420 as the balance of general funds. Taxes on gross receipts of corporations brought in $1,029,090; on collateral inheritances, $300,254; on insurance companies' licenses, $412,205; on motor-vehicle licenses, $733,858; on liquor licenses, $1,324,015. For the general government there were expended $499,384; for protection of persons and property, $671,164; for promotion of agriculture, $402,378; for conservation of natural resources, $156,094; for conservation of health, $132,470; for maintenance of highways, $2,664,-470; for maintenance of hospitals, homes and asylums, $1,448,274; for maintenance of correctional institutions, $157,750; for education, $1,907,025, and for interest on the public debt, $1,042,195.

Government.— The legislature consists of two houses: a senate of 27 members (one senator from each county and from each of four districts into which Baltimore city is divided), and a house of delegates of 101 members (each county sending from two to six delegates, and Baltimore city ranking as four of the largest counties). Regular legislative sessions are held biennially in the even years, beginning on the first Wednesday in January and may not exceed 90 days. Members receive $5 per day during the session. Extra sessions are held at the call of the governor and may not exceed 30 days. There are six representatives of the State in Congress: one from the Eastern Shore, a second from Harford, Baltimore and Carroll counties and a part of Baltimore city, a third and a fourth from districts entirely in the city, a fifth from southern Maryland and a part of Baltimore city and a sixth from western Maryland. The Democratic party usually has a majority in the general assembly. Senators are elected for four and delegates for two years. The executive department has at its head the governor, elected in 1919 and at four-year intervals thereafter. He receives a salary of $4,500 a year, the use of an executive mansion and an allowance for expenses. The administration is more unified than in many States, as the governor has extensive powers of appointment. His financial control is very great. All bills are submitted to him after passage by the general assembly for approval and veto. For some years he has possessed the power of vetoing separate items of appropriation bills, and it was even held that this power included that of diminishing the amount of appropriations voted by the legislature. In 1916 the people adopted a constitutional amendment which has placed an autocratic power of budget making in his hands. He now prepares and submits to the general assembly a proposed budget of appropriations, which they may diminish, but not increase, from which they may strike out items, but to which they can add none.

The judicial system of the State consists of three parts. The highest tribunal is a Court of Appeals of eight judges, seven of whom are the chief judges of the circuits into which the counties are grouped, and the eighth is chosen from Baltimore city. The governor designates one of these judges as chief judge. A Circuit Court is held in each county, and in each circuit there are two judges (in the circuit composed of Baltimore and Harford counties there are three judges), in addition to the chief judge. In Baltimore city there are 10 judges who sit together as the supreme bench of the city and assign themselves, from time to time, to sit separately in the several city courts. All these previously-named judges are elected for 15 years by popular vote at elections in odd years. A judge who has reached the age of 70 years may not complete his term, unless a special vote in his behalf is passed by the general assembly. Vacancies in judgeships are filled by the governor, whose appointees hold office until the next election.

Petty cases are heard before justices of the peace, who are appointed by the governor for the term of four years. In the counties, these officers are generally paid by fees. In Baltimore, such cases are brought before salaried officials serving in regular tribunals, as police courts (criminal), people's courts (civil) or juvenile courts.

Religion.— The first settlers were Roman Catholics and Anglicans. The first Protestant services were held by the Rev. Richard James, on Kent Island in 1632, and the first Roman Catholic services, by Rev. Andrew White, S.J., and Rev. John Altham, S.J., at Saint Mary's in 1634. A considerable settlement of Puritans from Virginia came into Anne Arundel County about 1650, and were largely induced to become Quakers when George Fox came to Maryland about 1670. He also established meetings on the Eastern Shore, one of which Third Haven, near Easton in Talbot County, possesses a house of worship over 200 years old. Presbyterians, under Rev. Francis Makemie, established churches on the lower Eastern Shore about 1690. Baptist churches were organized in the 18th century. The German-speaking settlers of the years 1730–50 brought the Reformed and Lutheran faiths into the



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State Capitol at Annapolis

province. Rev. Philip William Otterbein, pastor of a Reformed church still standing on Sharpe and Conway streets in Baltimore, founded the United Brethren Church in Frederick County in 1800. Robert Strawbridge, one of Wesley's local preachers, held the first Methodist services in the United States in Carroll County in 1761, and, through the labors of Francis Asbury and other devoted men, the Church spread rapidly. At the Christmas Conference held on Lovely lane (Redwood street), Baltimore, in 1784, the Methodist Episcopal Church was organized, and its first bishops, Francis Asbury and Thomas Coke, elected. Right Rev. John Carroll, of an old provincial family, was consecrated as bishop of Baltimore in the Roman Catholic Church in 1789; and his see was raised to an archbishopric in 1808. He was the first man to hold episcopal office in that Church in the United States. Right Rev. Samuel Claggett was consecrated bishop of Maryland in the Protestant Episcopal Church in 1789, being the first man to receive such consecration in the United States. In 1830 a desire for a greater participation of the laity in the government of the Methodist denomination led to a division and to the organization in Baltimore of the Methodist Protestant Church. Colored churches were organized under some of the above-named denominations during the 19th century, most of the churches being either Methodist or Baptist. The Roman Catholic Church is the largest denomination in its membership, and among the Protestant denominations, the Methodist, Episcopalian, Lutheran, Baptist, Reformed, Presbyterian and United Brethren, in the order named, lead in their membership. Sunday schools were first instituted in Baltimore about 1815. There are over 2,500 Sunday schools now in the State.

Charities and Corrections.—A Board of State Aid and Charities was established in 1900. The policy of the State has been to subsidize private institutions more than has been the case in most other portions of the Union. For the insane, there are three State-owned asylums: for whites at Catonsville (Spring Grove) in Baltimore County, at Sykesville, in Carroll County at Springfield, and at Cambridge in Dorchester County, and one for colored persons at Crownsville in Anne Arundel County. There are several private hospitals for the insane, the most important of which is the Sheppard and Enoch Pratt Hospital, which has a large endowment and is located near Towson, in Baltimore County. The State penitentiary is located in Baltimore city; the house of correction, for minor offenses, is located near Jessups, in Anne Arundel County. A reformatory school for white boys is found at Loch Raven, in Baltimore County, and one for colored boys at Cheltenham, in Prince George's County. A similar school for white girls is in Baltimore County, and one for colored girls at Melvale, in Baltimore city. Saint Mary's Industrial School for Boys, in Baltimore city, is an important reformatory for boys under the control of the Roman Catholic Church. Each county, as well as Baltimore city, possesses a jail. There is an almshouse for each county and for Baltimore city. The Baltimore city hospitals are paid to provide beds for the indigent sick. For tubercular patients there is a private sanitarium at Eudowood, in Baltimore County, and one owned by the State at Sabillasville, in Frederick County. The Federated Charities of Baltimore city are very efficient, and the Henry Watson's Aid Society does an important work. There are also many lesser benevolent institutions.

Education.— During the first 60 years of the history of the province there were almost no schools, because there were no towns, each family living upon its own plantation. Governor Francis Nicholson was an ardent friend of education and under his influence the assembly, in 1694, passed an act for the maintenance of free schools by duties laid on exported furs, which then formed a large part of Maryland's trade. In 1696, King William School at Annapolis was founded, as the first of these schools, and continued in existence until 1784, when it was merged in Saint John's College. Under Governor Nicholson's administration, also, the Anglican Church was established in the province, and the Rev. Thomas Bray, D.D., was sent over as the commissary, or representative, of the bishop of London, within whose diocese the province was considered to lie. He wished to induce worthy clergymen to come to Maryland and, as an inducement to them, set about establishing a parochial library in each parish for the use of the minister, and a provincial or lending library at Annapolis for the use of the clergy and gentry. He succeeded in this plan and the provincial library of 1,100 volumes was the largest collection of books then in the English colonies. Dr. Bray came to Maryland in 1700 for a few months and after his return the libraries languished and few books were sent them. The first printing press in the province was established about 1690, and the earliest extant imprint is one of Dr. Bray's sermons. The children of the well-to-do planters were often sent to Europe to complete an education begun on the plantation under private tutors, who were often indentured servants — the Protestant children going to Great Britain, the Roman Catholics to institutions on the Continent.

In 1723 an act was passed looking to the establishment of a grammar school in each county. These schools were the only ones supported by Maryland authorities, until well into the 19th century. Jesuits conducted two schools for boys — one at Whitemarsh, in Charles County, and one at Bohemia Manor in Cecil County. In 1726 the first newspaper in the province was begun, at Annapolis. Negro education and industrial education likewise found their beginning in Rev. Thomas Bacon's charity school in Talbot County about 1750. Toward the end of the provincial period, Charlotte Hall Academy was founded by the union of the county schools in southern Maryland, and Upper Nottingham Academy, in Cecil County, was begun. Rev. Samuel Knox, who was principal of the Frederick County Academy, in 1796 published a remarkable book on the 'Principles of Education,' outlining a complete educational system for the State. Thomas Jefferson derived many of the ideas which he carried out in the University of Virginia from this book, and Knox was the first man invited to a professorship there. Through Knox's efforts the State diverted to the county academies the funds it had begun ap-

propriating to the nascent colleges and these appropriations to the academies lasted until these institutions were absorbed into the public school system, a process not completed until the 20th century. A considerable agitation for public schools about the year 1825 led to the organization of such schools for Baltimore city in 1829. This city has always managed its schools independently of the subsequently established State system and in 1917 had 112 schools, with 2,139 teachers and 79,599 pupils. The expenditures for these schools for 1919 amounted to $3,217,554. In addition to primary and grammar schools, there are included in the city system for white children a high school for boys (called the Polytechnic Institute), two high schools for girls and a teachers' training school; and for colored children a high school and a teachers' training school. Although some counties had begun a partial school system, the State had no uniform public schools until the constitution of 1864 was adopted which contained a provision for such a State system, through the efforts of Joseph M. Cushing, Esq., a member of the constitutional convention, and Rev. Libertus Van Bokkelen, D.D., who was made first State superintendent of schools. Dr. Van Bokkelen was soon succeeded by M. A. Newell, who continued in office, both as superintendent and as principal of the State Normal School, established in Baltimore, for over 20 years. This school has been transferred to fine new buildings near Towson, in Baltimore County. Rev. E. B. Prettyman succeeded Mr. Newell, and was succeeded nearly 20 years ago by Dr. M. Bates Stephens, during whose incumbency of the office great advances have been made in the county schools. Since his taking of office, there has been a separate principal of the normal school. A second normal school has been established at Frostburg in Allegany County. High schools have recently been formed in many places.

Teaching colored children was unlawful during the times of slavery. In 1865 a society was formed in Baltimore for negro education. It speedily established schools throughout the State, supported by the generous contributions of individuals, many of whom were members of the Society of Friends. When the State assumed the task of educating negroes, in 1872, the society closed all its schools, except one in Baltimore, which was incorporated as the Colored Normal School. In 1908 the State took over this school also and removing it to Bowie, in Prince George's County, maintained it as Normal School No. 3, adding certain agricultural and industrial features to the course of study. In addition to the expenditure of the State for schools from taxation, the proceeds of which are quarterly distributed to the counties and Baltimore city, according to population, each county raises large sums yearly by local taxation for support of schools. There are 2,605 schools, 6,560 teachers and 246,045 pupils recorded in the report for the year 1917. The State school board consists of six members appointed by the governor for a period of six years. The governor also appoints a school board of three members for each county for a like term. The mayor of Baltimore city appoints the school board therefor, composed of nine commissioners, each to serve for six years. An extensive system of parochial schools is also maintained in connection with the Roman Catholic churches in Baltimore and in some of the smaller towns in the State.

Mrs. Eliza Seton, foundress of the Sisters of Charity in the United States, established a school at Emmitsburg for the education of girls in 1809. The Order of the Visitation conducts schools for girls in Baltimore and Frederick, the Carmelites in Baltimore and the Sisters of Notre Dame also in Baltimore.

Among the important private secondary schools in Maryland are: For boys, the Gilman County School, the Boys' Latin School and Marston's School in Baltimore city; the McDonough Institute and Farm School for needy orphans in Baltimore County, and the Jacob Tome Institute, a largely endowed boarding-school with fine buildings, at Port Deposit in Cecil County. The Hannah More Academy at Reisterstown in Baltimore County, the Frederick Seminary in Frederick County and Saint Mary's Female Seminary in Saint Mary's County, are the more important boarding-schools for girls, and in Baltimore city the Bryn Mawr School and the Girls' Latin School are day schools of high standard.

The Maryland Institute for the Promotion of the Mechanic Arts was established in Baltimore, in 1847. It formerly conducted exhibitions and gave courses of lectures in its long building upon Market space, which was the scene of several Presidential nominating conventions. After this building was consumed in the fire of 1904, a new building was erected on Mount Royal avenue for the Day Schools of Art and Design, and a building on the old site is used for the night school of mechanical drawing. George Peabody spent part of his early life in Baltimore, and in recognition of that fact he established in 1857 the Peabody Institute, which contains a very fine reference library, a lecture hall, an art gallery and a largely attended conservatory of music.

A school district library law was passed in 1873. In Baltimore the generous gift of about $1,200,000 to the city by Enoch Pratt in 1882 secured the establishment of the free library which bears his name and which was opened in January 1886, with Dr. Lewis H. Steiner as its librarian. This institution, the public library of the city, from its inception was planned to contain a central building and branches in different parts of the city of Baltimore. These branches have increased from 4 to 18 and several more will soon be built. In February 1919 the library possessed 363,646 volumes, and in the previous year it cirulated 586,645 books.

The Washington County Free Library at Hagerstown was established by the generosity of B. F. Newcomer in 1899, and has been conspicuously successful, being one of the first county libraries in the country. The other public libraries are small and are not as numerous as in many other States. In 1902 the legislature passed a law establishing a State Library Commission. The Public Library Commission now has its office at the State Normal School at Towson and receives $2,000 a year from the State. It circulates traveling libraries and gives advice and counsel to public libraries and to places desiring to establish them. In Baltimore city, there are also to be found the libraries of the various educational institutions of

the diocese of Maryland, of the Baltimore bar and of the Maryland Historical Society which are valuable special collections. The New Mercantile Library, a subscription one, containing about 35,000 volumes, should also be mentioned. In 1854 there was established in Baltimore the Maryland School for the Blind, a private corporation largely supported by the State. The school has removed, in recent years, to fine new buildings, on the cottage plan, in the suburb of Overlea, where about 100 children are instructed, coming from all parts of Maryland and the District of Columbia. A school for the colored deaf and blind, situated at a little distance but on the same grounds and under the same superintendent, instructs about 70 children. The Maryland State School for the Deaf, incorporated in 1867, is attended by about 120 pupils, and is situated at Frederick City, on the site of the barracks built during the Revolutionary War and occupied by prisoners from Burgoyne's army.

Higher Education.— The Rev. William Smith, D.D., who had been head of the College of Philadelphia from the beginning, was forced by the British occupation of that city to remove to Chestertown, where he became rector of the Protestant Episcopal church. He also took the principalship of the Kent County school and so developed it that he secured a college charter for the institution under the name of Washington College in 1782. It was the first institution named for General Washington, and the first collegiate institution in Maryland. Its history has been full of vicissitudes, but the college has continued its work with fair measure of success, and is still the only institution conferring degrees, situated upon the Eastern Shore. Since 1890, women have been admitted to its courses.

The Western Shore obtained its first institution of higher learning, when Saint John's College was chartered at Annapolis in 1784. For its site, the State gave the unfinished governor's mansion and its grounds. According to its charter, it was united with the Washington College into a University of Maryland, but this union was merely nominal. The State appropriation was withdrawn in 1805, and the college languished for a time. From 1837, for 20 years, Rev. Hector Humphreys, the principal, labored faithfully for its interests. The college was suspended and the buildings were used as a hospital during the Civil War. Reorganized by Henry Barnard, LL.D., Saint John's College has been under the principalship of Thomas Fell, LL.D., since 1887. The students are organized in a cadet corps and receive military training. It has been recognized as the faculty of arts of the University of Maryland for the past few years.

The French Revolution drove from Europe a large number of ecclesiastics of the Roman Catholic faith. The Right Rev. John Carroll, in his desire to provide educational opportunities for the youth of Maryland, especially for those of his Church, invited some of these teachers to settle in Maryland. Consequently, the Sulpicians began instruction in Baltimore in 1791. Their institution was called Saint Mary's College, and its title was afterward changed to Saint Mary's University. It gave regular academic instruction until 1852, when the college was closed, in order that the clergy might devote their entire attention to the theological training of young men for the priesthood in Saint Mary's Seminary of Saint Sulpice, which had been maintained by them as a part of their institution from its beginning, and which is the oldest Roman Catholic theological school in the United States. Cardinal Gibbons is its most distinguished graduate. In 1808, near Emmittsburg, in Frederick County, Rev. John Dubois, a Sulpician priest, founded Mount Saint Mary's College. This institution is now governed by the secular clergy, and in addition to the preparatory and collegiate courses, maintains a seminary preparatory to the priesthood. A third institution, which owes its origin to the Sulpicians, and which is still controlled by them, is Saint Charles' College founded in 1830, and endowed by Charles Carroll of Carrollton. It was formerly situated in Howard County, but is now located near Catonsville in Baltimore County. It gives the collegiate courses preparatory to Saint Mary's Seminary. In 1802 Dr. John B. Davidge opened a medical class in Baltimore, from which developed the College of Medicine of Maryland, chartered in 1807, and the University of Maryland, chartered in 1812. The university was planned to contain four faculties. That of medicine has always been the strongest, and is the only one which has enjoyed a continuous existence, always maintaining a course of medical instruction which ranked well among similar institutions. It has recently united to itself the College of Physicians and Surgeons (founded in 1872 and which had itself absorbed the Washington Medical College) and the Baltimore Medical College (founded in 1883) and is fulfilling the instructional requirements of the American Medical Association. The Maryland College of Pharmacy (founded in 1856) has recently been annexed, and the department of dentistry was opened in 1882. No school of divinity was ever organized. The school of arts had a troubled existence, and finally died, but has recently been revived by the union of Saint John's College with the university. The school of law was maintained for a few years, about 1840, with David Hoffman as professor, and was revived in 1869. Since that time, it has maintained high standards, and is the only law school in the State, having absorbed the Baltimore Law School (founded in 1900), and the Baltimore University School of Law (founded in 1890).

Several colleges and professional schools founded in Maryland at different times no longer exist. Among these are Cokesbury College (1784–96) at Abingdon in Harford County, the first Methodist institution of higher education in the world; Baltimore College (1803–30); Asbury College (1816–30) in Baltimore city; the College of Saint James (1843–63) in Washington County; Newton University in Baltimore city (1844–59); New Windsor College (1843–50, 1874–1910); and Calvert College (1852–73); both at New Windsor, Carroll County; the Baltimore Female College (1849–90); and the Mount Washington Female College (1856–61). Loyola College in Baltimore was founded in 1852 by the Jesuits and continues to educate boys according to their system, without dormitories. The Maryland Agricultural College, at College Park in Prince George's County, was chartered in 1856 by a private cor-

poration, and is in age the second such institution in the country. It early recognized agricultural experimentation as an important part of its operations. The State Agricultural Experiment Station, conducted in connection with the college, was organized in 1887. The students are trained in military drill, and the ownership of the college has lately been transferred to the State, which is largely increasing appropriations to it and widening its curruculum.

The Brothers of Christian Schools, a Roman Catholic fraternity, purchased the Rock Hill Academy at Ellicott City, Howard County, in 1857, and after conducting it for several years procured a charter for Rock Hill College in 1865. The Western Maryland College, a co-educational institution, at Westminster, in Carroll County, under the auspices of the Methodist Protestant denomination was chartered in 1868, and under the long presidency of Rev. Thomas H. Lewis, D.D., has firmly established itself. Goucher College for Women was founded by the Methodist Episcopal Church in 1884, and was opened in 1888, graduating its first class in 1892. It was first called the Woman's College of Baltimore; but, about 1910, the name was changed, so as to honor Rev. John F. Goucher, D.D., one of its principal founders and long its president. It ranks among the best institutions for the higher instruction of women. Hood College for young women, beautifully situated near Frederick City, has been conducted successfully for 25 years by its president, Dr. Joseph H. Apple, and gives a good course of instruction, emphasizing domestic science. The Maryland College for Women at Lutherville in Baltimore County is a long established institution. Morgan College, in Baltimore city, incorporated in 1889 under the auspices of the Methodist Episcopal Church, is the only collegiate institution for the education of the colored youth in Maryland. It expects soon to remove to a suburban location. A branch, Princess Anne Academy in Somerset County, is recognized as the State Agricultural College for colored youth.

The Johns Hopkins University at Baltimore city, incorporated in 1867, was founded by a bequest of about $3,500,000 from the man whose name it bears. It was notably a large endowment, and the trustees had an unusual opportunity to establish a distinctive institution. They made the best possible use of this opportunity by calling Daniel C. Gilman, LL.D., to become its first president and giving him free hand as to the places of organization. The university opened its collegiate and graduate philosophical departments in 1876. President Gilman won an instant success and a world-wide reputation for the institution. Among the leading ideas were these: (1) organization of graduate study into systematic training for the degree of doctor of philosophy, including a dissertation on some point embraced in the student's major subject and showing evidence of research; (2) provision for a university press to publish the results of the investigations of faculty and students; (3) a great use of popular lecture courses; (4) a body of instructors of originality of mind who were carefully selected, with an unerring view to their future eminence; (5) a body of young men connected with the graduate school, who should receive a stipend from the university, have time for original work and be known as fellows. (Among the early fellows was President Woodrow Wilson); and (6) an undergraduate department, arranged on the group system, with which President Gilman had become acquainted through experiments with it at the Sheffield Scientific School and the University of California, with which institutions he was formerly connected. The undergraduate department was never large, and was largely a local college; but the graduate department speedily enrolled an unusually eminent body of men from all parts of the United States, from Canada and from Japan. Many of these graduate students became teachers and spread the influence of the Hopkins far and wide. President Gilman's policy was to spend little money on buildings, and the quarters of the university were inconspicuous throughout the 25 years of his administration. Mr. Hopkins left another bequest, of about the same size as that of the university, to found a hospital which should bear his name, and which should be associated with the medical school of the university. The hospital buildings were completed in 1889, and steps were immediately taken to organize the medical school, whose first class graduated in 1898. It was the first of American medical schools to require a college degree as a prerequisite for admission, and it has done much to advance medical educational standards. Its reputation has become even greater than that of the philosophical department, and very recently the Rockefeller Foundation, through the efforts of Prof. William H. Welch, first dean of the medical school, has founded a school of public hygiene in connection with the university.

About the time of the close of President Gilman's administration, the philosophical department of the university was given, by public-spirited Baltimoreans, a new site, comprising about 100 acres in the northern suburbs, and the work of the institution was removed thither in 1914. The second president of the university was Ira Remsen, a distinguished chemist, and he in turn was succeeded by the present president, Frank J. Goodnow, an eminent student of public law.

Professional schools not previously named are the Woodstock College, in Baltimore County, founded in 1867, by the Society of Jesus, as a theological seminary; the House of Studies of the Congregation of the Most Holy Redeemer, Mount Saint Clement, at Ilchester, Howard County, established also in 1867, as a school to prepare members of the Redemptorist order for the priesthood; Saint Joseph's Seminary in Baltimore city to educate men for the Roman Catholic priesthood to labor among the colored people of the South; the Westminster (Carroll County) Theological Seminary under the auspices of the Methodist Protestant Church; and the Baltimore College of Dental Surgery, the oldest dental school in the world, chartered in 1839.

Proyincial History.— Verazzano in 1524 may have looked into the Chesapeake and landed on the Atlantic seaboard of Maryland, but the continuous history of this territory began, when Capt. John Smith, with 14 men in an open barge of three tons burden, left Jamestown in 1608, and spent several weeks in exploring the bay. On his return he drew a remarkably good map of the shores, so that they became well known. He found the aborigines of the Algonquin stock dwelling in small brick-bark

villages in the midst of forest clearings, in which they cultivated maize, potatoes and tobacco. On the Western Shore, the Piscataways and the Nanjemoys were the important tribes, and on the Eastern Shore dwelt the Nanticokes. These Indians possessed stores of furs which they had obtained in hunting and they, willingly, bartered them with the English for manufactured wares. In general, the Indians of the province received fair treatment from the colonists. Around the head of the bay, near the Susquehanna River, which bears their name, dwelt the fierce Susquehannocks, of Iroquoian stock, who were subjugated and incorporated with the Five Nations about 1670. After that time, the Senecas frequently came down to raid the frontier settlements, and to despoil the peaceful Patuxents and Piscataways of the Western Shore. Gradually the Indian inhabitants of Maryland disappeared, and the Nanticokes, in their migration to the Wyoming Valley in Pennsylvania about 1750, left but few of their race in the province.

After Smith's expedition, other Virginians sailed into the Chesapeake and the northern fur trade became a well-established enterprise. The Indians also sold maize to the Virginians, and timber was cut for pipe-staves. Chief among these Virginia traders was William Claiborne. He associated himself with the London mercantile firm of Cloberry and Company, and in May 1631 obtained, from the Secretary of State for Scotland, a commission, authorizing him and his associates to trade in all parts of New England and Nova Scotia, wherein no trading monopoly had been granted. With this commission, he sailed up the Chesapeake, and in 17 Aug. 1631 established a trading factory on Kent Island, with about 20 or 30 men. From Chisquack in the Northern Neck of Virginia and Kent Island, a delegate sat in the Virginia house of burgesses and Claiborne was a member of the Virginia council.

Sir George Calvert, first Lord Baltimore and formerly Secretary of State for England, retired from office because he had become a Roman Catholic. He had long been interested in colonial projects, and had received a grant of land and jurisdiction in Avalon, the southeastern peninsula of Newfoundland. He went there to live, but found the country so barren and the climate so severe that he determined to settle further to the south. Coming to Virginia, the colonists refused to admit him unless he should take the oaths of allegiance and supremacy, which his religious belief would not permit him to do. He was so delighted with the country, however, that he returned to England and successfully requested from the Crown a grant of the lands about the Chesapeake. To his possession, which was created a palatinate in which the proprietary should have as wide powers as the bishop of Durham in that county, he gave a name, in the courtier fashion, from that of the queen of Charles I, Henrietta Maria, daughter of Henry IV of Navarre. In the Latin of the Charter, the province was called Terra Mariæ, or, in English, Maryland. The limits of the grant were much wider than were ever reduced to possession, chiefly because of encroachments of the Duke of York on the Delaware and of William Penn on the north. Those limits were from Watkins Point on the Chesapeake, due east to the Atlantic Ocean, then along the seashore and Delaware Bay to the 40th parallel of north latitude, and along that parallel westward to the meridian of longitude, which passed through the first fountain of the Potomac River, then along the south, or far bank of that river, the boundary ran to Cinquack, near the river's mouth, whence a straight line should run to Watkins Point. The province was to be held in free and common socage upon a yearly payment of two Indian arrowheads to the Crown. All Englishmen might emigrate to Maryland, and, having arrived there, they and their descendants should enjoy all of the privileges of Englishmen. The proprietary was given power to make laws, "with the advice, assent, and approbation of the freemen, or of their delegates." He tried to use this power literally at first by submitting the draft of laws to a mass meeting of freemen, gathering in person or by proxy; but, gradually, the freemen grew too numerous, too widely dispersed and too powerful for this arrangement to continue. They successfully asserted for themselves the right of initiating laws as early as 1638, and from about 1650 a representative body of freemen sat as a House of Delegates, and there was formed a bicameral legislature, upon whose acts the proprietary had a veto. He was not obliged to submit these acts to the Crown. It is not surprising that the Virginians opposed this charter, which gave a Roman Catholic two-thirds of their noble bay, and cut them off from the profitable northern fur trade.

Before the charter had passed the seals, the first Lord Baltimore died, and it was issued, on 20 June 1632, to his son Cecil Calvert, second Lord Baltimore, a namesake of the great Lord Burghley, under whom the father's official career had begun. By the charter this first lord proprietary was granted a large country hitherto uncultivated, in the parts of America partly occupied by savages. He was destined never to see his province, but he took watchful care over it for nearly 45 years. After some months preparation his first colonial expedition sailed from England, on 22 Nov. 1633, under the command of his younger brother, Leonard Calvert, in two vessels of well-omened name — the *Ark* and the *Dove*. Leonard Calvert, commissioned as lieutenant-general and governor of the province, was only 28 years old, and was a sincere straightforward man, but had the fatal failing of his family, in being unable to read men and to choose the proper agents to carry out his purposes. With him went several gentlemen, most of whom were Roman Catholics, while the majority of the yeomen and servants were Protestants. It is probable that from the beginning the majority of the Maryland settlers paid no religious allegiance to the Pope of Rome. The voyage from England to America consumed from one to three months at that period, and as Leonard Calvert sailed by the southern route, stopping at the West Indies, he did not arrive in Virginia until 24 Feb. 1634.

The governor there was friendly, but the settlers were so hostile that they soon afterward revolted, seized him and sent him to England, largely because of his friendliness to Calvert. Lord Baltimore had wisely enjoined his brother to have as little to do as possible with the Virginians during the first year, and heed-

ing that advice, the settlers soon sailed up the bay and entered the Potomac River. They landed on Saint Clements' (now called Blackiston's) Island on "Our Blessed Lady's Day in Lent," 25 March 1634, on the first day of the year, according to their calendar, and in the beginning of spring, and "took solemn possession of the country, for our Saviour and our Sovereign Lord, the King of England." From the enthusiastic reports of the country sent him, Baltimore prepared and printed in England, in 1634 and 1635, two pamphlets called *Relations*, which were in the nature of prospectuses to invite colonists and are the earliest printed accounts of the province. The fears of the aborigines were pacified, and through the advice of Capt. Henry Fleet, an old Indian trader, Calvert bought from them their town of Yaocomico, which was renamed Saint Mary's. Claiborne's factory was the only other settlement of Europeans within the province at the time. Calvert had instructions to use Claiborne courteously and permit him to proceed in his plantation if he would acknowledge Baltimore as his overlord; but this acknowledgment was steadily refused, and a petty warfare arose between the settlers on Kent Island and those at Saint Mary's, which led to a naval combat on the Pocomoke River in 1635. Claiborne's difficulties increased, through differences with his London partners, and he went to England in 1637, leaving the factory in charge of Capt. George Evelin, who was friendly to Baltimore. He vainly endeavored to induce the settlers on the island to accept Baltimore as their ruler, and finally, in February 1638, Calvert led an expedition in person against the factory and overcame the opposition there, while Claiborne failed in England in an appeal to the Lords' Commissioners of Plantations. He never lost his animosity toward Lord Baltimore, and continued to the end of a long life his struggle against proprietary rule. Both in England and in America the Virginians tried to prevent Baltimore from taking possession of the province which had been granted him. The expense of his expeditions and of the litigation in England nearly impoverished him; but neither then nor, when later deprived of the province by force, did Cecil Calvert deviate from his persistent effort to secure himself and his descendants so valuable a possession. Remaining in England, he warded off one threatened danger after another, and his policy, as his letters disclose it, was that of a calm, shrewd, unenthusiastic, fair-minded, far-seeing man. He was a faithful member of the Roman Catholic Church, and wished to provide an asylum for his fellow-believers within his palatinate; but he wisely foresaw that any grant of especial privileges to the Roman Catholics — still more an establishment of that Church in the province — would lead to a speedy forfeiture of his patent. He clearly wished the establishment of no other church. Consequently, from the beginning of his settlement of Maryland, he set an example of a ruler who separated church from state, who directed his colonists to show toleration to all Christians and who allowed freedom of worship in any Christian form. Jews were tacitly permitted to dwell in the province. In his first expedition he sent two Jesuit priests, that the colonists might have religious counsel and guidance. One of the Jesuits, Father Andrew White, a man of marked devotion to his work, wrote an account of the voyage, in Latin and in English, to which we owe valuable information. The Jesuit order continued to be the chief religious agency of the Roman Catholic Church in Maryland throughout the whole of the provincial period, and their conscientious zeal and faithfulness deserve high praise. They reared from the provincial families a good many Jesuit priests who were very influential in the organization of their Church in the United States and were largely responsible for its American character.

Nearly a year after the landing of the colonists, Governor Calvert called an assembly of the people, which met in February 1635, but its proceedings are lost, and the proprietary vetoed its acts. The second assembly, held in January 1638, failed to place any acts upon the statute books, except one for Claiborne's attainder. Acting also as a court of law, the assembly tried and condemned to death for piracy, Thomas Smith, one of Claiborne's followers. During the year 1638 Lord Baltimore yielded his claim to the initiation of bills and a representative assembly of one house, meeting in February 1639, adopted a comprehensive temporary act to "endure to the end of the next General Assembly, or for three years, if there be no assembly within that time." From that date to the present practically all of the statutes of Maryland are preserved, and have been printed, in the series of the Archives of Maryland. The policy of passing temporary statutes was followed throughout the provincial period, and, although it involved much expenditure of time and produced a bulky statute book, it ensured fairly frequent sessions of the legislature, and also a readjustment, from time to time, in the rates of fees, in which shape the remuneration of many of the officers was received.

From Saint Mary's the settlers spread out along the rivers, some of the larger tracts of land being erected into manors. Indentured white servants cultivated most of the land, granted by the conditions of plantation to the settlers, on payment of an annual quitrent. Negro slaves were being introduced, and the colonists gradually ceased to be dependent upon the Indians for maize, which was beginning to be raised in considerable quantity by the English. The fur trade slowly lost its importance, and the cultivation of tobacco flourished until it became the staple product of the province and the medium of exchange in all transactions among the planters. The predominance of tobacco lasted throughout the provincial history; but, during the 18th century, the cereals — wheat and corn — were gradually displacing its prominence in agriculture on the Eastern Shore. The upland country of western Maryland never grew tobacco. A few iron furnaces were established late in the provincial times, but the main industry was agriculture. Transportation was at first by water or along the Indian foot trails. Gradually roads were laid out, along which hogsheads of tobacco, drawn by oxen or horses, were rolled to the water side.

The Jesuits vainly claimed from the proprietary the same liberty of being governed by canon law only, which they possessed in other lands having Roman Catholic lords, and of being freed from taxes. These claims led Balti-

more to send out secular priests for a time and to insist upon the supremacy of common law and of the civil power in the state. Leonard Calvert returned to England in 1642, leaving Giles Brent as his deputy, and came back two years later with the king's commission empowering him to seize ships owned by London merchants who adhered to the Parliamentary side in the English Civil War. He seems not to have used the commission, but it gave an excuse for action to those opposed to proprietary rule. Claiborne came back in the attempt to recover Kent Island. Richard Ingle, a pronounced Parliamentarian, who had previously made several voyages to the province, came to Virginia, with his ship, in February 1645, seized a Dutch merchantman in the Chesapeake, and with the two vessels terrorized the province. Calvert fled to Virginia, and Ingle ranged the province, during this "plundering year," seized the Jesuits' property and carried them to England. Calvert recovered control of Saint Mary's in the autumn of 1646 and of Kent Island in April 1647. Shortly afterward Leonard Calvert died, naming Thomas Greene as governor. A year later, the proprietary substituted William Stone, a Protestant, who brought into Maryland as immigrants a considerable number of Puritans from Virginia, where they had failed to find religious freedom. The Puritans made their settlements about the banks of the Severn, near the site of Annapolis, and a third county was erected for them, bearing the name of Anne Arundel, the wife of Cecil Calvert. With Stone's commission Baltimore sent a draft of a brief code of 16 laws, which he desired the general assembly to enact. The most famous of these, the "Act concerning religion," was amended and passed in April 1649. This notable act was well summarized, in its purpose and content, by Charles, third Lord Baltimore, as passed that the province might "have a general toleration settled there by a law, by which, all of all sorts, who professed Christianity in general, might be at liberty to worship God in such manner as was most agreeable to their respective judgments and consciences, without being subject to any penalties whatsoever for their doing so, provided the civil peace were preserved. And, that for the securing the civil peace and preventing all heats and feuds which were, generally, observed to happen amongst such as differ in opinions upon occasion of reproachful nicknames and reflecting upon each other's opinions, it might, by the same law, be made penal to give any offense in that kind." The credit for this act belongs in the first instance to Cecil, Lord Baltimore, and, secondly, to the assembly which adopted it. The coming of the Brooke family into Maryland led to the formation, in 1654, of a fourth county, bearing the name of Calvert, and situated on the north side of the Patuxent River.

When the Commonwealth had been established in England, five Parliamentary commissioners were appointed to reduce Virginia from her allegiance to the Crown and their commission, by craft or accident, was extended to "all the plantations within Chesapeake Bay." Two of these commissioners were Claiborne and Bennett, the head of the Puritan party in Virginia; the other three were Englishmen, but only one of these arrived in America. He acted with the two Virginians, and they seized the government of Maryland in 1652. Baltimore's hostility to Claiborne had been so great that he had exempted him and Ingle from a general pardon. Claiborne's counter-influence may doubtless be seen in the commissioner's illegal order, that writs should henceforth run in the name of the keepers of the liberty of England, instead of the proprietary, as provided by the provincial charter. Governor Stone refused to obey this order and was removed from office. Three months later he yielded and was restored, but after two years of compliance he again ordered writs to run in the proprietary's name. The Puritans of Providence, as they called their settlement on the Severn, promptly rose in revolt and compelled Stone to resign his office. When Baltimore rebuked him for yielding so easily, Stone gathered an armed force and a battle took place near Annapolis in March 1655 between the two parties, in which conflict the proprietary's party was routed and Stone was taken prisoner. From July 1654 to 1657 the provincial government was in the hands of a body of commissioners, appointed by Bennett and Claiborne, and serving as executive, provincial court and upper house of assembly. The Toleration Act was repealed. Cromwell, however, confirmed Baltimore's title to the province in 1656, and in March 1657 his authority was restored, a general amnesty being proclaimed and the Toleration Act confirmed. So complete was the pacification that some of the Puritan commissioners sat in the General Assembly of 1659.

A new county, Charles, named for the proprietary's heir, was organized in 1658 from the western part of Saint Mary's County. The restored proprietary government had as its governor Capt. Josias Fendall, an energetic man, who organized the militia and then came into conflict with the Quakers, a growing body in the province. When Fendall had been governor for two years he proved himself faithless to the proprietary, surrendered his commission as governor and accepted a new one from the assembly, which claimed the right to make laws without Baltimore's consent. When news of these disloyal acts reached England, Baltimore sent out with an amnesty his half-brother, Philip Calvert, as governor in Fendall's place. As soon as Calvert arrived in Maryland, the rebellion collapsed, and the lenient governor was content with inflicting fines as punishment, together with perpetual disfranchisement for a few leaders. Shortly afterward the proprietor substituted his only son, Charles Calvert, for his brother, Philip, who was given the chancellorship of Maryland as a solace. Leonard Calvert's son was soon made provincial secretary, and for 30 years a period of family government continued.

The Dutch had unsuccessfully attempted a settlement upon the Delaware in 1631, and the Swedes had been more successful in 1638. New Sweden had been reduced by the Dutch of New Netherland in 1655. Maryland's representative was sent to notify the Dutch that they were within the provincial boundaries and must acknowledge her jurisdiction or depart. Governor Stuyvesant, on his part, sent two envoys to Saint Mary's, one of whom was a Bohemian, Augustine Herman, who was so charmed by the land through which he traveled, that he removed into it and took up a tract in Cecil

County — Bohemia Manor — for which he paid by executing the first good map of Maryland. A brisk trade sprang up between the English settlers on the Chesapeake and the Dutch and Swedes on the Delaware. This lucrative trade was illicit, under the navigation laws which dated from about 1650, and was partly the reason why the provincial authorities hesitated to take decided action against the Dutch, until it was too late to do so; for the Delaware settlements were seized by the English fleet in 1664, and granted by the king to his brother, the Duke of York, as part of his province of New York. For several years there was friction between the two governments, and Calvert sent officers, from time to time, to summon the Delawareans to admit his overlordship, while he also granted lands in that region.

Cecil Calvert, first lord proprietary, died in 1675, and was succeeded by his son, Charles. During the years preceding this event, the boundary between Maryland and Virginia on the Eastern Shore was run, with some loss to the province through imperfect surveying; the tobacco trade flourished, and the settlements spread down the Eastern Shore, so that Talbot, Somerset and Dorchester counties were organized, and along the head of the Chesapeake, so that Baltimore and Cecil counties were established.

The second lord proprietary had as stormy an experience as his father. Indian troubles led to a joint expedition with the Virginians against the Susquehannocks in 1675. In shameful violation of a safe conduct, the Maryland commander weakly yielded to the Virginians' clamor, and five of the chiefs were wickedly put to death. After a month's siege of their fort, the Indians fled; some of them fleeing southward began that course of rapine which led to Bacon's Rebellion (q.v.) in Virginia, while others went northward to unite themselves to their Iroquois kindred, bringing down with them, from time to time, Senecas and Onondagas in hostile incursions against the English settlers and the friendly Indian tribes in Maryland.

In 1680 a disturbance arose, headed by Fendall and John Coode, a renegade Anglican clergyman. It failed, and Fendall was banished, but the discontent increased, and the «Popish Plot» in England, with the fear shown there for the overthrow of the Protestant religion, found reflection in Maryland, in the suspicion felt by many toward the Roman Catholic proprietary.

A worse danger for Maryland arose in 1681, when William Penn obtained a patent from the Crown for a large tract of land, bounded on the south by a «circle drawn at 12 miles distance from New Castle, northward and westward to the beginning of the 40th degree of north latitude and thence by the straight line westward.» Penn also obtained from the Duke of York a grant of New Castle, with a territory of 12 miles around it, and the lands bounding thence on the Delaware southward to Cape Henlopen. Penn began at once to colonize both his province, which took the name of Pennsylvania, and his territories on the Delaware, and endeavored to gain over the frontier inhabitants of Maryland, his great object being to gain access to the waters of the Upper Chesapeake. Baltimore strove to keep his province and wished to fix the 40th parallel at once. The two proprietors met several times, but Penn would not make direct observations of latitude. On the other hand, he suggested that measurement be made from the capes of the Chesapeake, by which means, he said, Baltimore might gain from Virginia as much as he would lose to the north.

While Penn delayed the decision as to the location of the 40th parallel, and placed his city of Philadelphia just south of it, so as to obtain the advantage of possession and to manifest his brotherly love for the rightful owner of the land by wresting his territory from him, he pressed hard for a determination of his claim to Delaware. The death of Charles II placed Penn's patron, the Duke of York, upon the throne, as James II, so that it is not surprising that the English Privy Council, on 7 Nov. 1685, decided that the peninsula should be divided between the claimants by a meridian line running from the latitude of Cape Henlopen north, until it was tangent to the circumference of the circle with a radius of 12 miles from Newcastle. This decision was based on a mistaken and highly technical application of the clause in the Maryland charter, by which the territory «hitherto uncultivated» was granted Baltimore. These words were, in any case, words of description and not limitation. Furthermore, at the time the charter was granted, the only Europeans within the province were fur traders, whose claim had been disallowed.

James II talked of having the Maryland charter forfeited, as a part of his general policy of colonial administration. The proprietary's position was weakened by the unfortunate killing of an obnoxious revenue officer, by a hot-headed Irish relative of Baltimore, Col. George Talbot. In 1684 Baltimore went to England to look after his affairs there, leaving the council in charge in Maryland. Four years later, he sent out to act as executive, a conceited, wordy lawyer, who was a strong partisan of King James, and who had high notions of prerogatives. Indian troubles occurred. Rumors arose of strange alliances between the Roman Catholics in Maryland and those in Canada. The messenger sent by Baltimore to order the proclamation of William and Mary died on the way, and the council refused to proclaim the new sovereigns, without orders from the proprietary. In July 1689, Nehemiah Blackistone, collector of royal customs, and an old enemy of Baltimore, rose in revolt, together with Coode and other Protestants. The agitators were so determined, and Baltimore's supporters were so lukewarm, that their «Protestant Association» was supreme within a month, and the proprietary government was overthrown. The new rulers asked the Crown to administer Maryland as a royal province, and their request was granted, the first royal governor coming in 1692. The charter was not forfeited, however, and the title to land and other private rights was left to Baltimore.

The royal governor brought a greater regularity and formality into the proceedings of the government. We find the development of a highly trained and able body of lawyers, who gave the Maryland bar its earliest renown. Francis Nicholson, as governor, saw the establishment of the Church of England in the province, and a levy made for its support of tobacco from every taxable person, a tax which continued until Maryland ceased to be a province.

About this time came the beginning of education and libraries in Maryland, and the first Presbyterian churches on the Eastern Shore were founded by Rev. Francis Makemie. The capital was removed from Saint Mary's City to a site on the Severn River, more centrally located, where the new town of Annapolis was founded, and named in honor of Queen Anne, who, with her husband, Prince George, are commemorated in the names of two counties — the latter being the first inland one on the Western Shore. Annapolis was the first town of any importance to be founded in the province. Nearly every planter's wharf could be reached by shipping, which carried away his tobacco or wheat, so that towns were the less necessary, and the frequent attempts to establish them during the provincial period were almost always fruitless. Annapolis, itself, though it boasted of a remarkably cultivated and charming society, and possessed some fine town houses of wealthy planters, yet had but little trade. After the Treaty of Utrecht placed an important part of the African slave trade in English vessels, the negro slaves rapidly increased in numbers throughout Maryland.

Charles, Lord Baltimore, died in 1715, and his son and heir, Benedict Leonard Calvert, had become a Protestant, so that the government was restored to him, as there was no longer any pretext remaining that it was unsafe to permit the proprietary to administer it. He did not long enjoy the restored palatinate, but survived his father for only two months, and was succeeded by his eldest son, Charles, fifth Lord Baltimore and fourth lord proprietary, who was still a minor. He was a skilful yachtsman, a dissolute, unlovely man, a friend and admirer of Frederick, the Prince of Wales, after whom he named his only son. This son was the last and the worst of the Lords Baltimore, and was proprietary from 1751 to 1771. Charles, Lord Baltimore, was the last one bearing that title to visit the province, where he spent the years 1732–33. While the province was under royal rule, the proprietary had an agent in Maryland to attend to his private affairs, and to watch that the government did not encroach upon his lands and revenues. He sent over from Europe, to fill that post, Charles Carroll, an Irish Roman Catholic, and the founder of an important family. At the time of the proprietary's restoration, the governor of Maryland was Capt. John Hart, a hot-blooded, capable Protestant-Irishman, a man of infirm health, who was continued in office by the guardian of the proprietary. Theoretically, the second Charles, Lord Baltimore, had the same position as his grandfather; but, practically, the 25 years of royal rule had made a vast difference. The people seemed to have cared but little for the change, and the proprietary was regarded as an absentee landlord, making little use of his power except as a means of appointing relatives and friends to office. In 1715 a comprehensive code was prepared by a committee of the assembly whose chairman was Andrew Hamilton. Shortly afterward he removed to Philadelphia where he was the first American lawyer to gain a continental reputation. From Philadelphia he was called to New York to defend John Peter Zenger in a famous libel case, having known Zenger long before, when both were neighbors in Chestertown in Kent County.

The Protestants soon found that there were no grounds for apprehension lest the Calvert family should lean too much toward the adherents of their ancestors' religion. The Roman Catholics were soon rudely disillusioned of their hope that they might regain, at least, a part of their old influence and position. They were even disfranchised, as a result of a violent contention between Carroll, on the one side, and Hart and the assembly on the other. Some little suspicion of Jacobitism made the Roman Catholics still more unpopular, and repressive laws against them continued in force throughout the whole of the provincial period.

Charles Calvert, a relative of the proprietary, was governor from 1720 to 1727. During this time the general assembly passed in 1723 a law for the establishment of a free school in each county, and a notable controversy arose between the proprietary and the legislature as to whether the English statutes extended to Maryland. This controversy lasted for several years, before the victory of the provincials whose bold resolutions were long remembered: "that this Province hath always hitherto had the Common Law, and such general statutes of England, as are not restrained by words of local limitation, and such acts of the Assembly as were made in the Province, to suit its particular constitution, as the rule and the standard of its government and judicature." Those who maintained the contrary, "intend to infringe our English liberties, and to frustrate the intent of the Crown" in the original grant of this province.

Benedict Leonard Calvert, younger brother of Lord Baltimore, came out to Maryland as governor in 1727, and died of consumption on his way home, in 1731. The promise of his high-minded, scholarly, lovable nature had not time for fulfilment. He had studied at Oxford, had made the "Grand Tour" on the continent of Europe and was a friend of Hearne, the antiquary. While he was governor, William Parks began at Annapolis the first newspaper in the province, though there had been a printing press there as early as 1690. Ebenezer Cook, who called himself "Laureate of Maryland," in his vigorous Hudibrastic satire, "The Sot Weed Factor," gave a lively picture of social life in Maryland and R. Lewis, master in King William's school, wrote poetry and edited a Latin poem, printed in Annapolis. During Calvert's administration occurred two important events which changed Maryland from a rural plantation province to a commercial and agricultural border state. In 1729 Baltimore town was laid out, at the head of navigation on the Patapsco, and grew to a great city, being near to the fertile western country. About this time, along the valleys of the Blue Ridge, from Pennsylvania down toward Georgia, came the sturdy, God-fearing, hardworking, German-speaking immigrants from the Rhineland, who came to Philadelphia, and so had their ties with the Pennsylvanians, rather than with the Virginians. This opening of the back country started that struggle between Philadelphia and Baltimore to obtain trade, which led Braddock, influenced by the colonists in Maryland and Virginia, to make his way westward through Maryland; but Forbes, influenced by the Pennsylvanians, to make his road toward Fort Du Quesne, through

their colony. The Germans in Maryland were not slaveholders, and devoted their attention to the growth of cereals rather than tobacco. They also began manufactures on a small scale, and thus diversified the industry of the palatinate. Charles, Lord Baltimore, came to Maryland in 1732, in an attempt to settle the boundary dispute with Penn's sons and heirs. He yielded to them all that they demanded, for some inexplicable reason, and presented them several million acres of land to which they had no right. Pennsylvanians had settled Philadelphia south of the 40th parallel, but they had no settlements west of the Susquehanna River. Beyond it Marylanders were already building their cabins near the north boundary of the province, and, under Capt. Thomas Cresap, they even fought for their rights. Baltimore agreed, nevertheless, to accept a line run due west on a parallel 15 miles south of Philadelphia, so far as the provinces had a common boundary. When he realized what he had done, he refused to run this boundary and applied to the English courts. The case dragged on until 1760, when the line of 1732 was finally accepted, and was surveyed between 1762 and 1767 by Charles Mason and Jeremiah Dixon, two excellent English surveyors. During the long governorships of William Bladen and Samuel Ogle, the province grew in population and wealth. Worcester County, on the Atlantic seaboard, was organized in 1742, and Frederick County, in the extreme west, in 1748. The *Annapolis Gazette,* established in 1752, published graceful and correct poems written by colonial gentlemen. The English magazines printed the results of the scientific observations in southern Maryland of Dr. Richard Brooke, physician and politician. In 1753, Horatio Sharpe came out as governor, and continued in that office until relieved in 1768 by the last proprietary governor, Sir Robert Eden, the brother-in-law of the last Lord Baltimore. Sharpe was a wise and popular man, who had a difficult position to fill during the French and Indian War, in which Fort Cumberland and other garrisons were placed in the west of the province; but in which Maryland played a discreditable part, owing to a niggardly proprietary and a narrow-minded, unpatriotic legislature.

Maryland joined with the other colonies in repudiating the Stamp Act, and forced the stamp distributor to resign his office and flee from the province. The general assembly passed bold resolves, refusing to admit taxation without representation, and claiming that the provincial legislature had the "sole right to lay taxes, or impositions, on the inhabitants of their province, or their property or effects." When the day arrived on which the Stamp Act should go into operation there was no stamped paper in the province. How could business be transacted, if unstamped paper was illegal? The Frederick County Court took a bold but sensible course, and declared that its business should be carried on without stamps, and the other courts of the province followed it in that course. Maryland was represented in the Continental Stamp Act Congress and took part in the non-importation agreement and in the correspondence with the other colonies, so as to present an united front against the British acts. The people of Annapolis burnt a vessel, *The Peggy Stewart,* laden with tea. Yet the province was conservative, and, in Sharpe and Eden, had two governors of unusual popularity. In 1774 Eden went to England for a few months. In June, during his absence, there met at Annapolis a "general congress of deputies from all the counties," to consider measures of opposition to England. This body was the first of a series of conventions, which chose delegates to continental congresses and appointed a Committee of Safety to act as an executive committee during the intervals between conventions; which enlisted troops and sent them to fight the British in Massachusetts; which directed the choice by each county of a Committee of Observation to care for local matters; and which, by the *Association,* a document offered in 1775 for subscription by the freemen of the province, expressed approval of the measures adopted by the Continental Congress in opposition to Great Britain, and united the people "in maintenance of good order and the public peace."

Eden had not only difficulties to contend with in connection with the British revenue acts, but also had to meet two local troubles. A strong party declared that the act, which provided for the support of the clergy, had not been properly passed, and so was void. A struggle over officers' fees caused great excitement. The acts fixing these fees were temporary, so that the legislature might readjust their rates every few years. The councillors held the chief offices and naturally desired large fees. When the fee act expired in 1770 all attempts to pass a new law failed, because of dissensions between the two houses of the assembly. What should be done in this emergency? Eden issued a proclamation forbidding any officer to take fees greater than those allowed in the old law. Of course, he was thereby virtually authorized to take fees at the old rate, and so the proclamation fixed the fees. A fierce controversy followed over the governor's right to do this; in which controversy, Daniel Dulany, the younger, who had attacked the Stamp Act, defended the governor, and Charles Carroll of Carrollton, a young Roman Catholic, who was the wealthiest landowner in the province, attacked him. The majority of the people undoubtedly agreed with Carroll, but the governor held the whip hand and fees were collected at the old rate, until British rule was overthrown.

In 1771 Frederick, sixth and last Lord Baltimore, died, and the title became extinct. He left the province to his illegitimate son, Henry Harford, the sixth and last lord proprietary. In his honor, Harford County, on the west side of the Susquehanna, was named, and, at the same time, Caroline County, the only inland one on the Eastern Shore, was created and named in honor of Lady Eden.

Eden's influence could not prevent acts of lawlessness from time to time, but his tact and good-fellowship with the colonial leaders, and the conservatism which had always showed itself in Maryland, kept the "ostensible form of government" intact, so that on 17 May 1776, the Provincial Convention denied that it was necessary to suppress the royal government, and, on 21 May, expressed the hope for a "re-

union with Great Britain on constitutional principles." Eden saw that the provincials would "not long be able to stem the torrents which, in several provinces," ran "strongly toward independence." He declined to accept the proposition of the convention that he remain as governor of Maryland, promising to take "no active hostile part, nor to correspond with the British government." Instead, he embarked on a British man-of-war on 23 June 1776, and sailed for England, where, in August, he was created Baronet of Maryland, an honor still worn by his descendants, in return for his skilful administration of the affairs of the province. Baltimore town and Frederick County eagerly sought independence. Samuel Chase, like a flame of fire, preached it throughout Maryland, Matthew Tilghman, William Paca, Charles Carroll the barrister and Charles Carroll of Carrollton urged it. So the convention voted on 21 June, to allow its deputies in the Continental Congress to unite with delegates from other colonies, in declaring independence and forming a confederation. On 3 July, the convention adopted her own declaration of independence, and, thereafter, began to prepare a permanent written constitution for the new State.

State History.— Maryland was equal to any other of the 13 original States in her zeal and fidelity to the common cause. On 2 Aug. 1776, her delegates to the Continental Congress signed the Declaration of Independence, and, in November, elections were held for officers in the new government, which was finally instituted, when the convention adjourned *sine die* in March 1777, and Thomas Johnson was inaugurated as the first governor. The State constitution was not submitted to the people. It provided for changes by passage of the amendment at two successive assembly sessions. The constitution contained a bill of rights and a frame of government, consisting of a governor, chosen annually by the legislature, and a general assembly of two chambers; a House of Delegates, elected annually, consisting of four Delegates from each of the 19 counties and two each from Annapolis and Baltimore; and a Senate of 15 members, chosen quinquennially by an electoral college, consisting of two members from each county and one from Annapolis and Baltimore. A governor's council was also provided, to be chosen annually by the legislature and to act upon his nominations. The judiciary was to be appointed by the governor. Suffrage was based upon the possession of property, and so there were a few negro voters.

Maryland entered into the Revolutionary War with zeal, and her troops were the only ones which were found in every campaign. At the battle of Long Island, on 27 Aug. 1776, the Maryland line won its first renown, and that renown was heightened in the Southern campaigns by its bravery in the battles of Camden, 16 Aug. 1780; the Cowpens, 11 Jan. 1781; Guilford Court House, 15 March 1781; and Eutaw Spring, 8 Sept. 1781. General William Smallwood, their commander, Gen. Mordecai Gist, and Col. John Eager Howard especially distinguished themselves. Tench Tilghman, a Marylander, bore the news of the surrender of Cornwallis and his army at Yorktown, on 19 Oct. 1781, from General Washington to the Congress at Philadelphia, and Dr. James McHenry of Baltimore, afterward Washington's Secretary of War, was one of the general's aides, or military family.

While Maryland was full of alacrity for the common cause, for a long time she refused to sign the Articles of Confederation, fearing danger from the claims of the great States, notably Virginia, to vast tracts of land west of the Allegheny Mountains. Maryland proposed to the Continental Congress that this far-extending territory be granted to the Union, and held as the common property of all the States, and refused to accede to the articles until this proposal was adopted, and Virginia, the most important of the claimants and the only one who had reduced her claims into possession, had made such a cession. This perseverance won, the desired cessions were made, the Western lands became the nation's domain and Maryland entered the Confederation as the 13th State on 1 March 1781. One of her delegates, John Hanson of Frederick County, was the first presiding officer of Congress under the new government. During the war, the State had confiscated the proprietary's lands and those of some of the Tories, who had among their number some men of wealth and some of the yeomen, especially on the lower Eastern Shore. In 1776 Frederick County was divided, the middle portion keeping the old name, the eastern one becoming Montgomery County, named after Gen. Richard Montgomery of the Revolutionary army, who was killed at Quebec, and the western portion becoming Washington County.

In November 1783, by invitation of Maryland, the Congress met in her State House at Annapolis, and in the senate chamber there General Washington resigned his commission on 23 Dec. 1783.

Maryland and Virginia had a common interest in the commerce of the Chesapeake and the Potomac, and, to arrange for its regulation, commissioners were appointed, who met at Alexandria and Mount Vernon in 1785. At that meeting, the desirability of uniform commercial regulations throughout the Union was considered and a convention for the discussion of such questions was called to meet at Annapolis in 1786. Only five States were then represented, and, through dissensions in the Maryland legislature, there were no Maryland delegates. Alexander Hamilton was a delegate, and, through his efforts, a second convention was summoned to meet in Philadelphia in 1787, which gathering drafted the Federal Constitution. Maryland's delegation to the convention divided, Luther Martin (an able lawyer and subsequently an ardent Federalist) and John Francis Mercer refusing to sign the document; while James McHenry, Daniel Carroll and Daniel of Saint Thomas Jenifer, did so. The people of the State elected delegates of strong Federal inclination to the convention called to consider the constitution, which ratified it 28 April 1788, by a large majority,—a vote which was considered to have had a considerable effect in Virginia.

In 1791 Maryland ceded to the Federal government, as a site for the seat of government, about 61 square miles on the north bank of the Potomac River at the head of navigation, and this, with a cession from Virginia, formed the District of Columbia. The portion taken from Virginia was later retroceded to her, so

that the territory of the present district was once entirely a part of Maryland. In 1796 Allegany County was formed from the western part of Washington County. During the early part of the 19th century, the Jeffersonian party in the State became organized, its leaders being two brothers: Gen. Samuel Smith, who sat in the United States Senate, and Robert Smith, who became Secretary of State.

When war was declared between the United States and Great Britain in 1812, Baltimore sent forth about 60 fast sailing vessels, which preyed as privateers on British commerce. In return, Admiral Cockburn sailed into the Chesapeake with a British fleet. He made a number of landings, and had skirmishes with the people. The Federal authorities were inefficient. Finally, in August 1814, a reinforcement of British troops having arrived under command of General Ross, the British fleet sailed up the Patuxent River and disembarked a considerable expedition. The British forces were met by the Americans near Bladensburg, and the latter were shamefully defeated. The British advanced and took the Federal capital — Washington. After a short time, they retired, reembarked on the fleet and sailed up the bay to attack Baltimore. The army under General Ross landed at North Point, and attacked the Maryland militia, driving them back several miles upon the defenses of the city. In the attack, General Ross was killed. A landing party to the southwest of the city was unsuccessful. Fort McHenry, on the end of a peninsula at the mouth of the harbor, was bombarded by the fleet. During the night of the bombardment, Francis Scott Key, a lawyer of fine ability, who was detained on a British ship, whither he had gone to endeavor to effect the release of a prisoner, wrote the "Star Spangled Banner." Having failed to take the city, the British withdrew. After the conclusion of peace, the farseeing merchants of Baltimore planned Western routes to secure trade for their city, and the Baltimore and Ohio Railroad came into being.

Maryland was a close State politically, and was so conservative that the Federalist party lingered there for years after it had gone out of existence elsewhere. In 1806 the property qualification for voters was abolished, a racial one being substituted. The growth of Baltimore city and the larger counties rendered the people therein discontented with the constitutional rules of equality of representation in the legislature. In 1837 the Democratic electors for the senate of the State, who numbered 19 out of 40 (the quorum being 24), refused to go into the body, in the hope of accomplishing constitutional revision. They failed to prevent the election of a senate, and the party was repudiated by the voters at the ensuing election, but the constitutional amendments desired were speedily achieved, and, in 1838, the governor's council was abolished; the governor's election made by the people for a three-year term; and the senate made also a body elected by the people, one member coming from each county and one from Baltimore city. Annapolis lost its representation in the general assembly. In 1836 Carroll County was established out of parts of Frederick and Baltimore, and took its name from the venerable Charles Carroll of Carrollton, who had been the last survivor of the signers of the Declaration of Independence, and had died in 1832. William Wirt, an eminent lawyer and a resident of Baltimore city, was nominated for the Presidency by the anti-Masonic party, and received the electoral vote of Vermont at the election of 1832. From that time, for 30 years, Baltimore was the place at which many National political conventions were held.

At this time, in Maryland, as in other States, large amounts had been borrowed to aid works of communication, such as railroads and canals. A financial crisis came upon the country, after the failure of the Bank of the United States to obtain a recharter, and Maryland was in danger of bankruptcy. That this evil was averted and the State's credit maintained was due to the high integrity of Thomas G. Pratt, then governor, and to the great helpfulness of George Peabody, then a London banker, but formerly in business in Baltimore. The failure to recharter the United States Bank was mainly due to two men, President Andrew Jackson and Roger B. Taney, a Maryland lawyer, who had been called to the President's Cabinet as Attorney-General, and, having already conceived a distrust for that bank, had not only agreed with the President in his opposition to it, but had increased his hostility. Taney was transferred to the Treasury Department, so as to accomplish more against the bank, by removing the Federal government deposits from it. The Senate refused to confirm the appointment — an unprecedented act. Jackson nominated Taney again to a seat on the Supreme Court bench, and the nomination was rejected. A vacancy in the chief justiceship gave Jackson a third opportunity to honor Taney, and a change in the membership of the Senate secured his confirmation, so that he presided over that august tribunal from 1838 to 1864. The Maryland bar was a famous body of men. William Pinkney, who served as Minister to England and won laurels as an orator in the United States Senate, was considered the leader of the American bar, until he died, and after Daniel Webster died, for 20 years, Reverdy Johnson was the most prominent American lawyer. Johnson was a Whig, served as Attorney-General in Taylor's administration, was twice senator from Maryland and was Minister to England.

Troops from Maryland played a gallant part in the Mexican War. The agitation for rotation in office and for a greater number of elective offices was so strongly felt in Maryland that a new constitution was adopted in 1851. The term of the governor was increased to four years, at which it has remained. At this time, Howard County was created out of part of Anne Arundel, and Baltimore city was made independent of Baltimore County. To use the English phrase, it was created a county borough. Maryland had given considerable support to the colonization of negroes in Liberia, and John H. B. Latrobe, an eminent lawyer, was for many years president of the Colonization Society, but there was little abolition sentiment in the State. The Republican party was not organized in Maryland until 1866, but there was very conservative Union sentiment in the State, and the Whigs had been powerful there. There was also a strong nativist element, which was brought into politics by a considerable foreign immigration to Baltimore about 1850, and by the

fact that these immigrants usually voted the Democratic ticket. As a result of the combination of these elements, Fillmore carried the State (the only one he did carry) as the native American (or "Know Nothing") candidate for the Presidency in 1856, and Thomas H. Hicks, the candidate of the same party, was chosen governor in 1857. Baltimore city, about that time, was characterized by election riots and disturbances between mobs, composed of partisans of "Know-Nothings" and of Democrats, and also between mobs, composed of adherents of rival volunteer fire companies. The police force there was inefficient, and, as a result, in 1860 it was placed under State control, under which it still remains. When the Presidential election of 1860 came, Breckenridge, the candidate of the Southern Democracy, carried the State by a narrow plurality, over Bell, the Conservative Union candidate, supported by the Old Line Whigs. As soon as Lincoln's election was announced, the Gulf States began to secede. Maryland was in a difficult situation. She was a border State, slaveholding, conservative, Union loving, having ties both to North and to South. Governor Hicks was a Union man, but not a man of strong personality. Lincoln called for troops. On the 19th of April, the Sixth Massachusetts regiment reached Baltimore. Locomotives were not then allowed to draw trains through the city, but mules pulled the cars from one station to the other along Pratt street. The commander of the regiment permitted his men to remain in the cars, and the crowd, seeing them so transported, became menacing. Stones were thrown, shots were fired and several men were killed on either side — the first bloodshed of the Civil War. Governor Hicks promptly called a session of the legislature to meet in Frederick, the centre of the Unionist part of the State, where the local influences overawed the Secessionists in the legislature, so that the question of disunion was never brought to a vote. Later, the Federal officers arrested some prominent disunionists and confined them for several months. Baltimore was reduced to quiet and obedience to Federal law, when Gen. Benjamin F. Butler, with Union troops, took post in May on Federal Hill, overlooking the city. There was some friction with Federal authorities during the remainder of the conflict but the question was settled that Maryland would continue loyal to the National government. The credit for saving Maryland to the Union is, in large measure, due to the efforts of Reverdy Johnson and Henry Winter Davis, an eloquent orator and congressman. Some Marylanders crossed the Potomac, and, enlisting in the Confederate army, fought bravely. Gen. Bradley T. Johnson was the most important of their officers. The Union army also contained a large number of Maryland soldiers, the chief officers being Gen. John R. Kenly and Gen. Charles E. Phelps. Union troops were stationed along the Potomac, and three important campaigns took place wholly or partly in the State. In the autumn of 1862, General Lee came into the State with the Army of Northern Virginia, and met General McClellan and the Army of the Potomac, near the village of Sharpsburg, on Antietam Creek, in Washington County, fighting there a bloody battle, after which Lee was forced to retire into Virginia. This Maryland campaign had, as one of its incidents, the occupation of Frederick by Stonewall Jackson, which gave rise to the poem of "Barbara Frietchie." In 1863 Lee crossed the State twice on his way to and from Gettysburg, and, in 1864, Gen. Jubal A. Early entered Maryland, and fought the battle of the Monocacy near Frederick against Union forces under Gen. Lew Wallace. They were defeated, but the delay they caused the Confederate army, together with a second delay, occasioned by Early's stopping to collect a ransom of $200,000 from Frederick, gave the Federal authorities time to bring troops to Washington and avert danger of the capital's falling into the Confederate's hands. A raiding party came within five miles of Baltimore at this time. During the war, James R. Randall wrote the song, "Maryland, my Maryland," to encourage the secession element in the State.

Augustus W. Bradford, a Union man, was chosen governor in 1861, and, under his administration, was held the Constitutional Convention of 1864, the result of whose deliberations was declared adopted in October, by a very small majority, made up by the soldiers' vote. This constitution abolished slavery, increased the representation of Baltimore, making it equivalent to three counties, provided for a lieutenant-governor, instituted registration of voters and established a State system of public education. It also prohibited, in the strictest terms, any persons who had sympathized with the Confederate States from holding office or voting, and provided that all voters must take an oath that they "have been truly and loyally on the side of the United States."

Thomas Swann was elected governor, and C. C. Cox, lieutenant-governor, on the Union ticket in November 1864. When the Civil War ended in 1865, the Union party, which had been a coalition one, fell into pieces. Governor Swann became a Democrat, while Lieutenant-Governor Cox and Henry Winter Davis organized the Republican party, which was a minority one for 30 years. Reaction from the extreme loyal position of the constitution of 1864 led to the assembling of another Constitutional Convention in 1867, which drafted the constitution under which the State is still governed, the people having declined in 1887 and 1907 to call a Constitutional Convention — a proposition which the constitution directed to be laid before them every 20 years. This constitution abolished the office of lieutenant-governor and the "iron clad oath" of loyalty, and rearranged the judiciary. By this constitution, Wicomico County was established on the Eastern Shore, out of Dorchester and Somerset. In 1872 the western part of Allegany County was created into Garrett County, named for John W. Garrett, president of the Baltimore and Ohio Railroad. This is the last county to be organized.

Oden Bowie was the first governor under the new constitution, and he was succeeded in 1872 by William Pinkney Whyte, a lawyer of marked ability, who held, at one time or another, nearly every elective office in the gift of the people, and who was the head of the Democratic organization until about 1880. Then Arthur P. Gorman, who had been a prominent member of the legislature, succeeded him as the director of Democratic politics, and continued to keep the organization in the hands of himself and his friends until his death in 1906. During

most of that quarter of a century, he was a member of the United States Senate. The legislatures of 1868 and 1870 were unanimously Democratic, but, in that of 1872, a small Republican minority appeared, under the leadership of Dr. Lewis H. Steiner of Frederick County.

A one-party State is apt to find that abuses creep in, and such became the condition in Maryland. An independent reform movement in the Democratic party led to refusal on the part of many to accept the nomination of John Lee Carroll of Howard County for governor in 1875. A reform ticket was nominated, headed by J. Morrison Harris, a Republican, and containing the name of S. Teackle Wallis, a Democrat and the leader of the Baltimore bar, as candidate for the attorney-generalship. This ticket carried the counties, but gross frauds in Baltimore city were sufficient to show Carroll's election on the face of the returns. The Court of Appeals, in a decision welcomed as a precedent by Republicans in the Presidential contest of the succeeding year, decided that it could not go back of the returns, and Carroll became governor. The reform Democrats and independent Republicans then organized the Baltimore Reform League, and for 30 years waged an unparalleled conflict against the dominant party organization. Gradually, the independent voters came to hold the balance of power, especially in Baltimore. No independent ticket was nominated, but the League steadily continued for good election laws, honestly administered and from time to time supported such Republican candidates as stood for the same purposes as the League. This policy led both parties to nominate better men and much improved political conditions.

In 1877 the most terrible strike of working men occurred, which Maryland has yet known, when a reduction in wages of the employees of the Baltimore and Ohio Railroad led to such rioting that the National Guard was insufficient to quell it, and the assistance of Federal soldiers was requested. The efforts of the reform element led to the nomination, by the Democratic party in 1879, of William T. Hamilton of Washington County, for the governorship. He was elected by a large majority, and, though hampered by an unfriendly legislature, accomplished some reform. In 1882, the Reform League achieved its first victory in Baltimore, electing "new judges," in coalition with the Republicans, over the old judges, who had been renominated by the Democrats.

Robert M. McLane was elected governor, in 1885, but, being appointed Minister to France, he did not complete his term. In 1887 the Baltimore and Ohio Railroad ceased to pay dividends, and many citizens who were stockholders suffered severe losses. The road struggled along until 1896, when it went into the hands of the receivers, John K. Cowen and Oscar G. Murray. They were two remarkable men; the one, an able lawyer; the other, a skilled railroad operator, and, by the daring issue of receiver's certificates, and by extensive reconstruction of the road, they were able, after a little more than three years, to return it to its stockholders under the original charter. Cowen became the first president of the reorganized road. A tunnel was dug under Baltimore, in order to secure direct connection between the lines on the east and those on the west of the city.

In 1887 Elihu E. Jackson was elected governor. In 1889 disastrous floods in western Maryland so damaged the Chesapeake and Ohio Canal that it was never afterward successfully operated. Fifteen years later, it was sold to the Western Maryland Railroad. In 1890 the financial interests of the State suffered a great shock, by the discovery of the misappropriation of over $100,000 of the State's funds by the State treasurer, a man who had been universally trusted. The loss to his bondsmen was heavy, and the incident gave an especial incentive to the founding of bonding companies in Baltimore. The long-continued complaint of intimidation and fraud at elections, especially in Baltimore city, led to the passage of an Australian Ballot Law in 1890. This statute much improved the conditions, but was a measure which needed much later amendment.

Frank Brown, of Carroll County, was chosen governor in 1891, and in 1894 he found it necessary to call out the National Guard to preserve order in consequence of a miners' strike in Allegany County. In that year's Congressional elections, the Republican party, for the first time, had a majority in the State. This fact gave the party fresh courage, and, in 1895, it nominated a strong candidate for governor, Lloyd Lowndes of Allegany County. The Reform League supported him, as did ex-Governor Whyte, and many other Democrats, who had become dissatisfied with conditions in their party and in the State. Especial efforts were exerted to prevent intimidation or fraud in Baltimore city. The election resulted in a Republican legislature and a large popular majority for Lowndes. For many years, one United States senator had been chosen from either shore of the bay, but now that rule was broken, and a Republican, George L. Wellington of Allegany County, was chosen senator, the other senator being Arthur P. Gorman of Howard County. The same session saw the passage of an excellent ballot law, prepared by the Reform League (which did away with all riot and intimidation, and almost all fraud at the polls), and the establishment of the State Geological Survey, whose achievements have been very extensive, and of a remarkable scientific character.

In 1896 William J. Bryan was nominated for the Presidency, by the Democratic party, and this choice was not received with favor in Maryland, where the sentiment in favor of a gold standard was strong, and where the party had always called itself the Democratic-Conservative party. The Prohibitionists nominated Joshua Levering of Baltimore, but his vote was small. William McKinley, the Republican nominee, carried the State by 32,000 plurality, and every Republican candidate for Congress was elected. President McKinley called to his Cabinet, as Postmaster-General, James A. Gary, of Baltimore, a prominent manufacturer. In 1897 a general assembly was chosen, Republican in both branches, the only time such has been elected. They adopted a new city charter for Baltimore, by which a board of estimates was established, and empowered to prepare an annual budget for the city. Louis E. McComas of Hagerstown, an experienced jurist, was elected to the United States Senate. In the Spanish

War, which occurred during that year, Maryland troops did not have the opportunity of service outside of the country, but two natives of the State gained renown: Adm. Winfield Scott Schley and Gen. Harrison G. Otis, both of whom were born in Frederick.

The Democratic party won the gubernatorial election of 1899, owing in part to dissensions among the Republicans, and John Walter Smith of Worcester County defeated Governor Lowndes, who sought re-election. Governor Smith succeeded to the leadership of the Democratic State party organization, when Senator Gorman died. Four years after the close of his term as governor he was elected to the United States Senate. In 1900 the State cast its electoral vote for McKinley, by nearly 14,000 majority. Governor Smith called the legislature in extra session in 1901 to amend the ballot law and to provide for a State census, since certain frauds, which were afterward corrected by the Federal officials, had been discovered in the National Census of 1900. The Democratic party now entered upon a continuous policy for suppressing the votes of negroes and the election law adopted in 1901 abolished party emblems and columns from the ballot, and included other provisions, making it easy for election officials to throw out ballots. The election of 1901 turned upon the question of approving, or condemning, this election law, under which so-called trick ballots, difficult to vote, were used in certain counties. A Democratic legislature was chosen, but, of the two State officials elected by small majorities, one was a Republican. In 1902 the Republicans carried the State on the Congressional vote; but, in 1903, Edwin Warfield of Howard County, head of one of the Baltimore bonding companies, was elected governor on the Democratic ticket. About this time, an era of construction of public buildings occurred at Annapolis. The state house, erected in Governor Eden's administration, was enlarged; a building was erected for the Court of Appeals and the State Library; and the United States Naval Academy, established during the administration of President Polk, when George Bancroft was Secretary of the Navy, was rebuilt. On 7 Feb. 1904 occurred the great fire in Baltimore, which burnt over about 160 acres of ground in the centre of the city, and destroyed nearly $100,000,000 worth of property. A Burnt District Commission with created to deal with the emergency, streets were widened and new piers built. An adequate sewer system, at a cost of about $25,000,000, was installed about the same time, and the city entered upon a new era of progress. In the autumn of 1906 the erection of a new Young Men's Christian Association building was made possible in Baltimore, by the raising of over $400,000, through the first of those intensive canvasses which have since been so often resorted to in the city.

The legislature of 1904 proposed to the voters a constitutional amendment relating to the suffrage, usually known as the Poe Amendment, from the name of John P. Poe, Esq., a prominent lawyer who drafted it. It included the so-called "grandfather clause," and gave officers of registration considerable power, the object being to prevent most of the negroes from voting, and so render the success of that party certain. However, the amendment was opposed by the governor, the attorney-general and many other prominent Democrats, as well as by the united body of Republicans, and was defeated at the polls in the election of 1905, by a majority of 35,000, although a Democratic majority was chosen in the general assembly then selected. Twice subsequently, a futile attempt was made to have a similar amendment incorporated in the State constitution, before the effort was finally relinquished. In the Presidential elections of 1904 and 1908 the electoral vote of the State was divided, so close was the result.

In President Roosevelt's Cabinet, Charles J. Bonaparte, Esq., of Baltimore, who had been prominent in reform movements, served as Secretary of the Navy and as Attorney-General. In 1906 the legislature passed the bill for oyster culture, usually known by the name of B. Howard Haman, a Baltimore attorney who drafted it, and this was the commencement of the conservation movement. Shortly afterward a State Forestry Commission was appointed, which has done good work.

In 1904 the movement for good roads began, which had such remarkable development during the gubernatorial term of Austin L. Crothers, of Elkton, Cecil County, which lasted from 1908 to 1912. Isidor Rayner, Esq., an eloquent man, was elected to the United States Senate, in 1904, by the Democrats.

Phillips Lee Goldsborough, of Cambridge, Dorchester County, who was chosen governor in 1911 was the second Republican to attain that office. His administration was efficient and characterized by progress. He was succeeded by Governor Emerson C. Harrington, also of Cambridge, a Democrat, who was chosen in a close election. The enactment of the budget amendment to the constitution occurred during his administration. The first popular election of a United States senator resulted in the election of Dr. Joseph I. France, the Republican nominee. The electoral vote in 1912 and 1916 was cast for the Democratic candidate. Governor Harrington appointed a Council of Defense which rendered valuable service during the Great War. Maryland contributed nearly 50,000 soldiers to the United States army,—the 115th and 313th regiments, especially, being almost entirely composed of Maryland men, and they gave a good account of themselves on the battlefield. Several army camps, etc., were located in the State, the most important ones being Camp Meade at Admiral, in Anne Arundel County, Camp Holabird, in Baltimore County, and the Edgewood Proving Grounds in Harford County.

Population.—Maryland had a population in 1790 of 319,728; in 1850, 583,034; in 1870, 780,844; in 1890, 1,042,300; in 1900, 1,188,044; in 1910, 1,295,346; in 1917 (estimated) 1,373,673. The principal cities are Baltimore (558,485 in 1910, large district annexed in 1917, now estimated, 669,891); Cumberland (21,859); Hagerstown (16,507); Frederick (10,411); and Annapolis (8,609).

The Press.—There are three morning daily papers published in Baltimore: the *American* (Republican), established in 1774, the *Sun* (Democratic), established in 1837, and the *Daily Record* (legal); and there are three afternoon papers: the *News*, *Evening Sun* and *Star*. Several weekly and monthly religious

and trade magazines are published in Baltimore, as are the magazines issued by the Johns Hopkins Press, the oldest of American university presses. In each county-seat there are usually two newspapers printed, and in the smaller cities there is generally found a daily newspaper.

The following is a list of the governors of the State:

LORDS PROPRIETARY OF MARYLAND.

1632–1675. Cecilius Calvert, Second Lord Baltimore.
1675–1715. Charles Calvert, Third Lord Baltimore.
1715. Benedict Leonard Calvert, Fourth Lord Baltimore.
1715–1751. Charles Calvert, Fifth Lord Baltimore.
1751–1771. Frederick Calvert, Sixth Lord Baltimore.
1771–1776. Henry Harford.

PROPRIETARY GOVERNORS OF MARYLAND.

Leonard Calvert 1634–47
In absence in Virginia in 1638, he left John Lewyer and Thomas Cornwalleys in charge of the province. In 1641 he left Cornwalleys again in charge for two months. From June 1643, to September 1644, he was in England, leaving Giles Brent as acting governor. In October 1644, William Brainthwayt was acting governor. In February 1645, Edward Ingle usurped the province. Anarchy prevailed from the middle of 1645 to July 1646, when Edward Hill was chosen governor by the council and confirmed by Calvert, from Virginia. Calvert resumed rule in the fall of 1646.
Thomas Greene 1647–49
William Stone 1649–54
During Stone's absence from the province in 1649 and 1650, Thomas Greene and Thomas Hatton acted as governor. In March 1652, Richard Bennett, Edmund Curtis and William Claiborne took possession of the government. In June, Stone was restored.
Commissioners. Settlers appointed by Parliamentary Commissioners or by Provincial Court 1654–58
Josias Fendall 1658–60
Philip Calvert 1660–61
Charles Calvert (became Lord Baltimore 1675. 1669–1670 Philip Calvert, acting governor) ... 1661–76
Cecilius Calvert 1676
Nominal governor. Deputy governor Jesse Wharton actually carried out duties.
Thomas Notley 1676–79
Charles, Third Lord Baltimore 1679–84
Benedict Leonard Calvert (nominal governor. Council exercised power. Vincent Lowe, president) 1684–88
William Joseph (President of Council) 1688–89
Protestant Associators 1689
Convention of Freemen and John Coode, commander-in-chief 1689–90
Nehemiah Blakistone 1690–92

ROYAL GOVERNORS

Sir Lionel Copley 1692–93
Sir Thomas Lawrence (President of Council) ... 1693
Sir Edmund Andros 1693–94
Col. Nicholas Greenbury (President of Council) .. 1694
Sir Thomas Lawrence (President of Council) 1694
Francis Nicholson 1694–99
Nathaniel Blakistone 1699–1702
Thomas Tench (President of Council) 1702–04
John Seymour 1704–09
Edward Lloyd (President of Council) 1709–14
John Hart 1714–15

PROPRIETARY GOVERNORS (RESTORED)

John Hart 1715–20
Charles Calvert 1720–27
Benedict Leonard Calvert 1727–31
Samuel Ogle 1731–32
Charles, Fifth Lord Baltimore 1732–33
Samuel Ogle 1733–42
Thomas Bladen 1742–47
Samuel Ogle 1747–52
Benjamin Tasker 1752–53
Horatio Sharpe 1753–69
Robert Eden 1769–76
(Richard Lee, President of Council, acting governor 1774)
The Convention and Council of Safety 1776–77

STATE GOVERNORS OF MARYLAND.

Thomas Johnson		1777–79
Thomas Sim Lee		1779–82
William Paca		1782–85
William Smallwood		1785–88
John E. Howard	Federalist	1788–91
George Plater	"	1791–92
James Brice	"	1792
Thomas Sim Lee	Federalist	1792–94
John H. Stone	"	1794–97
John Henry	"	1797–98
Benjamin Ogle	"	1798–1801
John F. Mercer	Democratic-Republican	1801–03
Robert Bowie	"	1803–06
Robert Wright	"	1806–09
Edward Lloyd	"	1809–11
Robert Bowie	"	1811–12
Levin Winder	Federalist	1812–15
Charles Ridgely of Hampton	"	1815–18
Charles Goldsborough	"	1818–19
Samuel Sprigg	Democratic-Republican	1819–22
Samuel Stevens, Jr.	"	1822–25
Joseph Kent	"	1825–28
Daniel Martin	Anti-Jackson	1828–29
Thomas K. Carroll	Jackson-Democrat	1829–30
Daniel Martin	Anti-Jackson	1830–31
George Howard	Whig	1831–33
James Thomas	"	1833–35
Thomas W. Veazey	"	1835–38
William Grayson	Democrat	1838–41
Francis Thomas	"	1841–44
Thomas G. Pratt	Whig	1844–47
Philip Francis Thomas	Democrat	1847–50
Enoch Louis Lowe	"	1850–53
Thomas Watkins Ligon	"	1853–58
Thomas Holliday Hicks	American	1858–62
August W. Bradford	Unionist	1862–65
Thomas Swann	Unionist later Democrat	1865–68
Oden Bowie	Democrat	1868–72
William Pinkney Whyte	"	1872–74
James Black Groome	"	1874–76
John Lee Carroll	"	1876–80
William T. Hamilton	"	1880–84
Robert M. McLane	"	1884–85
Henry Lloyd	"	1885–88
Elihu E. Jackson	"	1888–92
Frank Brown	"	1892–96
Lloyd Lowndes	Republican	1896–1900
John W. Smith	Democrat	1900–04
Edwin Warfield	"	1904–08
Austin L. Crothers	"	1908–12
Philips L. Goldsborough	Republican	1912–1916
Emerson E. Harrington	Democrat	1916–1920

Bibliography.— Bozman, McMahon, McSherry, Scharf's 'Histories of Maryland,' Browne's "Maryland" in 'American Commonwealths,' Hall, 'Lords Baltimore'; Maryland Archives (Provincial History, 38 volumes have so far appeared), Maryland Historical Society Fund Publications, Maryland Historical Society Magazine, Fiske's 'Old Virginia and her Neighbors,' numerous mongraphs in Johns Hopkins University Studies in Historical and Political Science, etc.

BERNARD C. STEINER,
Librarian of The Enoch Pratt Free Library, Baltimore.

MARYLAND AGRICULTURAL COLLEGE, a State institution founded in 1856 at College Park, Md., for education in agriculture and its ancillary sciences. At present it has the following departments: agriculture, horticulture, biology, chemistry, mechanical engineering, civil engineering, electrical engineering, canning and preserving, also training courses in agriculture for teachers and a summer school. A great part of the college plant was destroyed by fire 29 Nov. 1912. The college was housed for a time in temporary structures, but new buildings have since been erected, of which the principal are Calvert and Morrill Halls. The college plant is valued at $525,000 and the annual income is about $170,000. There are 10,000 volumes in the library. The faculty numbers 40 and the student body about 500.

MARYLAND CAMPAIGN OF SEPTEMBER 1862. The Union army under General Pope having been defeated and driven to

the defenses of Washington, General Lee, 3 Sept. 1862, marched from Chantilly for Leesburg. At the end of the first day's march Lee wrote to Jefferson Davis that the time seemed propritious "for the Confederate army to enter Maryland" and give her material aid in the recovery of her liberties. The next day he reached Leesburg, and again wrote that he was fully persuaded of the benefit that would result from an expedition into Maryland, and should proceed at once to make the movement, unless it was disapproved; also that he proposed to enter Pennsylvania, unless it should be deemed unadvisable upon political or other grounds. Without waiting for a reply to his two communications he crossed the Potomac at White's Ford, near Leesburg, on the 4th, 5th and 6th, with an army of over 60,000 men, and marched to Frederick, Md., where, on the 8th, he suggested to President Davis that the position of affairs "placed it in the power of the government of the Confederate States to propose with propriety to that of the United States the recognition of our independence." On the same day he issued an address to the people of Maryland, stating his mission among them and that he was prepared to assist them in regaining the rights of which they had been despoiled. When Lee entered Maryland east of the Blue Ridge he took it for granted that the Union garrison at Harper's Ferry would be withdrawn, thus opening his line of communication through the Shenandoah Valley. This was not done, and it became necessary to dislodge the garrison from that post before concentrating the Confederate army west of the Blue Ridge, and Lee came to the decision to divide his army and capture the Union forces at Martinsburg and Harper's Ferry. On the morning of the 10th his army was put in motion from Frederick. Walker's division of two brigades crossed the Potomac at Point of Rocks, south of Harper's Ferry, and on the morning of the 13th established itself on Loudoun Heights; Jackson, with 14 brigades, marched over South Mountain at Turner's Gap, crossed the Potomac at Williamsport on the 11th, drove General White from Martinsburg into Harper's Ferry (q.v.), and at noon of the 13th appeared before Bolivar Heights and invested Harper's Ferry from the Virginia side of the Potomac. McLaws, with 10 brigades, marched over Brownsville Gap of the South Mountain, crossed Pleasant Valley and on the evening of the 13th was in full possession of Maryland Heights (q.v.), thus completing the investment of Harper's Ferry and its garrison of over 12,000 men. General Lee, with nine brigades of Longstreet's command and D. H. Hill's division of five brigades, followed Jackson over South Mountain, leaving Hill near Boonsboro to support Stuart's cavalry, which had been left east of the Blue Ridge. Lee, with Longstreet, moved to Hagerstown, there to await the capture of Harper's Ferry, and then to concentrate his army for a movement into Pennsylvania, the capture of Harrisburg and the destruction of the long railroad bridge over the Susquehanna. Meanwhile General McClellan, who had been placed in command of the Union troops for the defense of Washington, took the field at the head of over 87,000 men, and marched against Lee. His army, spread out like a great fan, its left on the Potomac and its right on the Baltimore and Ohio Railroad, cautiously advanced on Frederick, which was occupied on the 12th, and here McClellan found a copy of Lee's orders showing the disposition of his scattered command. Tardy pursuit began; on the morning of the 13th Franklin's Sixth corps and Couch's division were put in motion to carry Crampton's Gap, in South Mountain, and relieve the garrison in Harper's Ferry, while McClellan, with the rest of the army, marched for Turner's Gap, six miles north of Crampton's, to cross the South Mountain and attack Lee. Franklin defeated the Confederates at Crampton's Gap on the 14th and, passing into Pleasant Valley, interposed between McLaws and Lee. Burnside, with the First and Ninth corps, attacked D. H. Hill at Turner's Gap and Fox's Gap the same day, Lee retraced his steps from Hagerstown to reinforce Hill, but when night came Lee had suffered defeat. He now abandoned his intention of invading Pennsylvania, ordered McLaws to elude Franklin and recross the Potomac somewhere south of Shepherdstown Ford, and at 10 o'clock that night put his own command in motion to recross the Potomac at Shepherdstown Ford, at the same time sending an order to Jackson to march from his investment of Harper's Ferry up the south side of the Potomac to Shepherdstown and cover the crossing. He crossed the Antietam in the morning of the 15th, where he hoped that McLaws might join him, but Franklin confined McLaws in Pleasant Valley. At noon he heard that Jackson had captured Harper's Ferry, whereupon he concluded not to retreat across the Potomac, but to give battle to McClellan on the heights and banks of the Antietam, and ordered Jackson to join him as soon as possible. McClellan followed Lee on the morning of the 15th, defeated Fitzhugh Lee's cavalry brigade in the streets of Boonsboro, and in the evening reached the banks of the Antietam to see Lee's army drawn up on the heights beyond. Franklin was left in Pleasant Valley to watch McLaws and relieve Harper's Ferry. Jackson joined Lee on the morning of the 16th, bringing Walker's division with him; McLaws eluded Franklin, passed out of Pleasant Valley and through Harper's Ferry, and joined Lee very early in the morning of the 17th. The battle of Antietam (q.v.) or Sharpsburg, the bloodiest one-day battle of the war, was fought on the 17th; both armies remained inactive on the 18th, and that night Lee recrossed the Potomac at Shepherdstown Ford. McClellan followed on the morning of the 19th to the banks of the Potomac. On the 20th a part of Fitz-John Potter's Fifth corps crossed the Potomac at Shepherdstown Ford (q.v.), and was attacked and driven back across the river with great loss. This ended the campaign. From the beginning of the campaign to its close, 5–20 September, the Union losses, including Harper's Ferry and Maryland Heights, were 2,671 killed, 11,766 wounded and 13,542 captured or missing, an aggregate of 27,979. The Confederate losses were 1,979 killed, 9,607 wounded and 2,336 captured or missing, an aggregate of 13,922. The results of the campaign were momentous and far-reaching; the Confederate cause lost prestige and the National cause brightened. Recognition of Confederate independence by Great Britain and France, about to be granted, was withheld, and 22 September Abraham Lincoln issued his preliminary proclamation of emanci-

pation. Consult 'Official Records' (Vol. XIX); 'McClellan's Own Story'; Michie, 'Life of Gen. McClellan'; Palfrey, 'The Antietam and Fredericksburg'; Allan, 'History of the Army of Northern Virginia'; Walker, 'History of the Second Army Corps'; Long, 'Life of General Lee'; Fitzhugh Lee, 'Life of General Lee'; Cooke, 'Life of Stonewall Jackson'; The Century Company's 'Battles and Leaders of the Civil War' (Vol. II).

E. A. CARMAN.

MARYLAND HEIGHTS, a bold, wooded elevation in Maryland, rising 1,000 feet above the Potomac opposite Harper's Ferry (q.v.), W. Va. In these heights, Elk Ridge, lying west of South Mountain, from which it is separated by the narrow Pleasant Valley, terminates. The heights are almost inaccessible, capable of strong defense, and completely command Harper's Ferry, which lies below it in the angle formed by the junction of the Potomac and Shenandoah rivers. When Harper's Ferry was seized by the Virginia forces in April 1861, Col. T. J. ("Stonewall") Jackson promptly occupied Maryland Heights, and they continued in Confederate possession until June of that year, when Gen. J. E. Johnston withdrew from the line of the Potomac and fell back to Winchester. The heights were then occupied by Union troops, and 5 Sept. 1862, when Lee crossed into Maryland, they were held by Col. T. H. Ford with about 2,000 men and some heavy siege and field artillery. When Lee, at Frederick, Md., found that Harper's Ferry and the heights were still held by the Union troops he sent three columns to surround and capture the garrison of more than 12,000 men. Jackson moved from Frederick on the morning of 10 September, crossed South Mountain and the Potomac, and, driving everything before him, bivouacked on the 13th near Bolivar Heights. Walker crossed the Potomac south of Harper's Ferry and seized Loudoun Heights. McLaws, with 10 brigades, marched from Frederick late on the 10th, camped that night near Brownsville Gap, crossed the gap next day, and on the 12th crossed Pleasant Valley, ascended Maryland Heights, with Kershaw's and Barksdale's brigades, at Solomon's Gap, five miles north of Harper's Ferry, drove in some skirmishers and, marching southward on the crest of the mountain, was checked near nightfall by Ford's men behind a barricade of logs. In the morning of the 13th he renewed his attack, which was stoutly resisted by Ford's men, who meanwhile had been reinforced by troops from Harper's Ferry. The Union troops were finally driven from the heights into Harper's Ferry, abandoning four guns, and at 4.30 P.M. McLaws was in complete possession, and put guns in position commanding Harper's Ferry, whose garrison surrendered on the 15th. The Union loss on Maryland Heights was about 150 killed and wounded; the Confederate loss was 35 killed and 178 wounded. After Lee had been driven across the Potomac the heights were occupied 20 September by troops of the 12th corps. The position was strongly fortified, and when, 15 June 1863, Milroy was defeated and driven from Winchester, General French moved his garrison from Harper's Ferry to the heights. Under General Meade's order French abandoned the position and distributed his troops at Frederick and on the line of the Baltimore and Ohio Railroad. When Lee was defeated at Gettysburg the heights were reoccupied, 7 July, by the Union forces, and continued in their possession until the close of the war. On 2 July 1864 General Early reached Winchester on his way to menace Washington; General Sigel, who was commanding the Union forces in and around Martinsburg, abandoned his position on the night of the 3d, crossed the Potomac at Shepherdstown, and on the night of the 5th established himself on Maryland Heights, with six regiments of infantry, 2,500 dismounted cavalry, two batteries of heavy artillery and 26 field-guns, while General Stahel was at Weverton and in Pleasant Valley, with 1,200 to 1,500 cavalry and four guns. Early followed Sigel across the river at Shepherdstown Ford, drove Stahel back and confined Sigel within his works; a heavy cannonade was kept up all night of the 6th, and there was sharp fighting next day; but, making no impression, and unable to manœuver Sigel out of his position, Early drew off and crossed the South Mountain toward Frederick.

E. A. CARMAN.

MARYLAND HISTORICAL SOCIETY, The, was first proposed as a project by John H. B. Latrobe in 1835, and was organized in his law office on 27 Jan. 1844, largely "through the zeal and execution" of Brantz Mayer. It was incorporated in 1845, and, joining with the Baltimore Library Company, a proprietary library founded in 1796, solicited gifts for a building to be called the Athenæum, a solicitation so successful that the organizations removed to permanent quarters therein on 23 Oct. 1848. In 1852 the Baltimore Library Company disbanded, giving its books and its share in the building to the Society. The Mercantile Library Company occupied a part of the Athenæum on a lease from the beginning until about 1880. In 1916 Mrs. H. Irvine Keyser gave the Society, as a memorial to her husband, the former residence of the late Enoch Pratt, at the corner of Monument and Park streets in Baltimore, and erected on the rear of the lot a fireproof library and art gallery. The buildings were opened with suitable exercises 18 Feb. 1919. The Society has about 800 members. Its presidents have been Gen. John Spear Smith, 1844 to 1866; Col. Brantz Mayer, 1866 to 1871; John H. B. Latrobe, Esq., 1871 to 1891; Severn Teackle Wallis, Esq., 1892 to 1894; Rev. John G. Morris, D.D., 1895; Albert Ritchie, Esq., 1896 to 1904; Mendes Cohen, Esq., 1905 to 1914, and Hon. Edwin Warfield, 1914 to the present. The Society possesses a valuable collection of books and manuscripts, including the Calvert Papers, purchased from a descendant of the last Lord Baltimore. It has published a series of publications from a fund given by George Peabody, and now prints the quarterly *Maryland Historical Magazine*. As agent for the State it has supervised the printing of 38 volumes of Maryland archives, dealing with the Provincial and Revolutionary periods of the State's history, most of which volumes were edited by the late Dr. William Hand Browne.

MARYLAND YELLOWTHROAT, one of the most familiar of North American warblers (*Geothlypis trichas*). It is about 5.5 inches

in length, migratory, makes a neatly concealed nest on the ground, almost always in a swamp or near a stream, and lays pink-white eggs delicately dotted with red. The plumage is bright yellow above, duller toward the tail; wings and tail greenish; under parts nearly white; and a characteristic jet-black mask across the face and on the sides of the head. The summer cry is a sharp questioning "*What of it? Where'd ye get it?*" The genus contains several related and similar species, but the Kentucky warbler (*Opornornis*) is no longer included.

MARYLEBONE, mā'rĭ-lĕ-bōn or mār'lĭ-bŭn, a metropolitan borough of London, England, in the northwest quarter. It contains the Coliseum, Middlesex Hospital, University College, Bedford College, Regent's Park and several railroad terminals. Among its famous residents have been Edward Gibbon, Michael Faraday, Charles Dickens and Turner. Its population is 117,184. See LONDON.

MARYSVILLE, mā'rĭz-vĭl, Cal., city, county-seat of Yuba County, at the junction of the Yuba and the Feather rivers and on the Northern Electric, the Southern Pacific and Western Pacific railroads, 52 miles by rail north of Sacramento.

Charles Covilland, a Frenchman, founded Marysville in 1849, after the discovery of gold in California. A trading-post named New Mecklenburg had been established some years before. Covilland called the place Yubaville, which name it retained until 1850, when Marysville was adopted, and the following year it was chartered as a city. Its location at the head of navigation and proximity to valuable mines contributed to its growth, so that in 1860 it was the third city in size in the State. Since 1865 it has declined in importance and population. The chief manufactures are dried and canned fruits, olive oil, flour, cigars, woolen goods and foundry products. It has considerable trade in the products of the surrounding farms, especially in grains, fruits, olives, rice, prunes, raisins, sheep, wool and cattle. The mines of the vicinity contribute to its industrial wealth. The city is the seat of the College of Notre Dame (Roman Catholic) for women, public and parish high schools, and it has a fine public library. The city hall and courthouse are handsome, well-built edifices. Levees costing $2,000,000 protect it from floods which occur periodically. Pop. 5,430.

MARYSVILLE, Kan., city, county-seat of Marshall County, on the Big Blue River, and on the Union Pacific, the Saint Joseph and Grand Island and the Topeka and Northwestern railroads, about 80 miles in direct line northwest of Topeka. The manufactures are flour, cigars, furniture, foundry and machine-shop products. The city has the largest cigar factory in the State, considerable trade in wheat, corn, fruit and livestock. Pop. 2,260.

MARYSVILLE, Ohio, village, county-seat of Union County, on Mill Creek, and on the Cleveland, Cincinnati, Chicago and Saint Louis and the Toledo and Ohio Central railroads, about 30 miles northwest of Columbus. It is situated in an agricultural, livestock and dairy region, in which the farm products are mostly wheat, corn and oats; also wool, sheep, horses. The chief manufactures are dairy products, wagons, carriages, cooperage products, lumber, plumber's supplies, brass stamping, silos, cigars, evaporated milk, etc. Among the important buildings are the State Reformatory for Women, State Armory and Carnegie Public Library. Pop. 3,576.

MARYVILLE, Mo., city, county-seat of Nodaway County, on the Omaha and Saint Louis line of the Wabash, and Creston and Saint Joseph line of the Burlington railroads, 46 miles north of Saint Joseph and 90 miles southeast of Omaha. It is in a rich agricultural region and is an important centre for the raising of fine livestock and poultry. The manufactures are cigars, lightning-rods, acetylene, generators, harness, cement blocks, work garments, sheet metal products. It is in an important banking and retail trading centre. There are two daily and two weekly newspapers. It is the home of the Fifth District State Normal School and the Maryville Business College. It has an active Commercial Club. There is a well-equipped Catholic hospital. Other important buildings are post office, high school, county courthouse and seven churches. Pop. 6,720.

MARYVILLE, Tenn., village, county-seat of Blount County, on the Knoxville and Arkansas Railroad, about 16 miles south of Knoxville. It was settled as early at 1795. It is in an agricultural and stock-raising region and near valuable marble quarries. Coal is found in the vicinity. The chief manufactures are flour, lumber, woolen goods and dairy products. It is the seat of the Maryville College (Presbyterian), founded in 1819; the Freedmen's Normal Institute (Friends); and a normal school. Maryville has a fine courthouse and some good church buildings. The Aluminum Company of America has located one of its plants here and employs several hundred men. The present population is about 7,500.

MARYVILLE COLLEGE, an institution in Maryville, Tenn., founded in 1819 under the auspices of the Presbyterian Church. The school is coeducational, and in 1915 had over $900,000 property and endowment, 55 instructors, 771 students and about 15,000 volumes in the library. It has a four-year preparatory department and the college course leads to the degree of A.B.

MARZIALS, Theophile, or Theophilus, English musician: b. Brussels, Belgium, 21 Dec. 1850. He was a pupil of music at London of M. L. Lawson and studied also at Paris and Milan. From 1870 he was employed in the British Museum, where he became superintendent of the department of music. He is best known as a vocal composer ('Twickenham Ferry'; 'Three Sailor Boys'; 'Wait till you Come to Forty Years'; 'Ask Nothing More'); and he also published 'A Gallery of Pigeons and Other Poems; 'Pan Pipes' (1904), etc.

MASACCIO, mä-sät'chō, **Tommaso**, properly **Guidi**, gwē'dē, Italian painter: b. San Giovanni, Tuscany, 24 Dec. 1402; d. Rome, about 1428. He went while very young to Rome, where he painted in the church of Saint Clemente a series of frescoes, the finest of which represents Saint Catherine and the doctors before Maxentius. In 1421 he was admitted into the guild of the Speziali at Florence. Among the works of Masaccio are the frescoes in the Brancacci Chapel of the Carmine, the 'Expulsion from Paradise'; 'Saint Peter's Sermon';

the 'Tribute'; 'Saint Peter Baptizing'; and the 'Raising of the King's Son,' the last of which was partly painted by Filippino. Consult Knudtzon, 'Masaccio og den florentiniske malerkonst' (Copenhagen 1875); Delaborde, 'Les œuvres et la manière de Masaccio' (Paris 1876); Schmarsow, 'Masaccio Studien' (Cassel 1895).

MASAI, mä-sī, an East African race, speaking the Hamitic language and occupying the Lake Kenia district. The Masais are men of large stature and magnificent physique. They are a warlike people and live mostly in military kraals, eating nothing but beef and drinking nothing but milk. The labor is done by slaves, women and children. They are to a certain degree nomadic, live in huts constructed of boughs and enclose their villages with huge thorn fences. Because of the climate they are better clothed than tribes of the warmer regions. Consult Hollis, A. C., 'The Masai: Their Language and Folklore' (Oxford 1905); Merker, M., 'Die Masai' (2d ed., Berlin 1910); Thomson, 'Through Masai Land' (London 1885).

MASAMPO, Korea (Chosen) treaty port on the south coast opened to foreign trade 1 May 1899. It has a good harbor, with steamer connection with Fusan. Since the advent of the Japanese a naval station has been constructed and a Japanese city is being erected. The commercial greatness of Fusan has eclipsed somewhat that of Masampo, which, nevertheless, is forging ahead as the leading commercial and industrial centre of southern Korea. Pop. about 35,000.

MASANIELLO, mä-sä-nē-ĕl'ō, the commonly received name of TOMMASO ANIELLO, Italian revolutionist: b. Amalfi, 1623; d. Naples, 16 July 1647. He was a fisherman at Sorrento, and in 1647 roused and led an insurrection against the Spanish viceroy, the Duke of Arcos. He was successful and obtained the abolition of unjust taxes and the revocation of an order to establish the Inquisition at Naples. The fruit taxes were abolished and the old civic rights restored. But the people soon rose against him, too, and he was assassinated. An opera, music by Auber, libretto by Scribe and Delavigne, based on his career, was presented in 1828 in Paris as 'La Moette di Portici,' and in 1829 in England in English as 'Masaniello.' Consult Saavedra, 'La insurrección de Napoli en 1647' (Madrid 1849).

MASARYK, Thomas (Tomáš) **Garrigue,** author and first president of the Czecho-Slovak Republic: b. Göding, Moravia, 7 March 1850. A Slovak by race and the son of poor parents, young Masaryk was apprenticed to a blacksmith after receiving an elementary education. He soon forsook the stithy and studied philosophy at Vienna and Leipzig. Appointed lecturer on that subject at Vienna in 1879, he made his mark by a study on "Suicide" as a pathological symptom of the condition of contemporary Europe, attributing its chief cause to the decline of religious sentiment. He became professor of philosophy in 1882 at the new Czech University in Prague, where he distinguished himself as an interpreter of modern political and social tendencies to a growing body of students drawn from all branches of the Slav family. Commenting on the movement for reunion and reconciliation among the Serbs and Croats already in 1909, Hermann Bahr (q.v.) wrote: "So strong has been the influence of the lonely Slovak at Prague" that his pupils had "inspired their shattered country with belief in the future." Elected to the Austrian Parliament in 1891, Masaryk boldly criticized the bureaucratic policy of Austria in Bosnia-Herzegovina and resigned his seat in 1893 as a protest against the negative policy of Czech Nationalists. For a number of years he edited the critical review *Athenæum,* which he founded in 1883, and later *Nashe Doba* (*Our Epoch*), dealing with religious criticism and Church history. He exposed as modern forgeries two manuscripts (of Gruenberg and Königinhof) which had long been treasured as national heirlooms, while later, in a famous "blood ritual" trial, he demonstrated the absurdity of the ritual murder charge brought against a Jew. Professor Masaryk married an American and as a political economist is well known in the United States through his lectures at the University of Chicago and other American institutions. He himself has been strongly influenced by the teachings of Comte, Spencer, Tolstoy and Dostoyevsky. His works were mostly written in German, but subsequently translated into Czech. He has published 'Ueber den Hypnotismus' (Vienna 1881); 'Der Selbstmord als Soziale Massenerscheinung der modernen Zivilisation,' the most important of his works (Leipzig 1887); 'Ueber das Studium der Dichter Werke' (2 vols., Leipzig 1884–86); 'Grundzüge einer konkreten Logik' (1885); 'Unsere heutige Krisis' (1895); 'Die Moderne Evolutions — Philosophie' (1896); 'La Question bohémienne' (1895); 'Die philosophische und sozialistische Grundlagen des Marxismus' (Vienna 1898); 'Die Stellungnahme der Sozialistenpartei zur Ethik' (1896); 'Ideale der Humität' (1902); 'Intelligenz und Religion' (1907); 'Freie wissenschaftliche und kirchlich — gebundene Weltanschauung' (Vienna 1908); 'Russland und Europe: Soziale Skizzen' (1913).

Among these historical and philosophical writings, his powerful criticism of Marxian Socialism and the great work on "Russia and Europe" stand foremost. He rendered great service in spreading translations from English literature in Bohemia, where his influence also permeated the entire younger generation, as it did among the Southern Slavs and among the Ruthenes. In 1907 he was re-elected to the Austrian Parliament. During the Friedjung trial in 1909 (see AUSTRIA-HUNGARY AND THE WAR, Vol. II, p. 637) he helped to expose the forgeries upon which Count Aehrenthal based his annexation of Bosnia and Herzegovina. When the European War broke out he remained in Prague till December 1914, when he escaped to Italy and thence to England in time to avoid arrest. He then became lecturer in the School of Slavonic Studies at the University of London. On 6 Dec. 1916 the Austrian Clerical organ, *Reichspost,* announced that Professor Masaryk had been sentenced to death *in contumaciam* for high treason. Meanwhile, the "condemned" man was rapidly gaining wide recognition among the Allies as the leader of the national struggle for Czecho-Slovak independence. Together with Dr. Benes and Colonel Stefanik, he formed the triumvirate which was ultimately

recognized by the Allied governments as the trustee for the future government of Bohemia. In the spring of 1917 Professor Masaryk was called to Russia by Professor Milyukoff, but soon realized the hopelessness of the Russian situation and devoted strenuous efforts to organize the Czecho-Slovak army. He preceded this force to Vladivostok and went on to Tokio and Washington. He had several audiences of President Wilson and addressed many public meetings. The republic of Czechoslovakia was recognized by Great Britain on 3 Aug. 1918; by the United States on 2 Sept. 1918; by Japan 9 Sept. 1918 and by Italy on 23 April 1918. The Declaration of Independence was formally published in Paris on 18 Oct. 1918 and the republic was formally proclaimed at Prague on 29 October. The Constitution was drafted in Geneva by 2 Nov. 1918, when the government was chosen. On 21 Dec. 1918 President Masaryk made a triumphal entry into Prague and then took oath to the new republic. In his first message to the members of the National Assembly delivered on 26 Dec. 1918 in the presence of representatives of the Allied governments, the President sketched the policies and principles of the two opposing groups in the great conflict and expressed the "gratitude and unshakable fidelity" of the republic toward the Allies. See CZECHO-SLOVAKS; SLAVS; WAR, EUROPEAN.

MASAYA, mä-sī'ä, Nicaragua, town, in the western part, about 12 miles north of Lake Nicaragua and near Masaya volcano, which is 3,000 feet in height. The town is connected by railroad with the cities of Leon, Managua and Granada. Masaya is situated in an agricultural region, of which tobacco is one of the principal productions. Coffee, sugar and rice are also grown in the vicinity. The inhabitants are mostly Indians. Pop. 13,000.

MASBATE, mäs-bä'tā, Philippines, an island of the Philippines in the eastern part of the Visayan Sea, south of Luzon and northwest of Samar; greatest length, 82 miles northwest to southeast; width, 45 miles; area, 1,236 square miles. It is very mountainous, the central chain being semi-circular in shape, extending from southwest to southeast, and there are several rivers of considerable size. Communication between towns and villages is mostly by water, as there are few roads or even trails. The staple products are sugarcane, cotton, chocolate and hemp; tobacco of a strong quality is also raised. One of the chief industries is that of stock-raising (cattle, horses and hogs); over 1,000 head of cattle are ordinarily shipped monthly to other parts of the Philippines, mostly to Manila. This industry has been menaced in recent years by the rinderpest. Other important industries are the manufacture of sugar sacks from the buri palm, the manufacture of palm mats of superior workmanship and coloring, weaving, lumbering and fishing; there is also an active trade with Manila. In March 1901 the island was united with Ticao (140 square miles), Burias (258 square miles) and the small adjacent islands, to form the province of Masbate; area of the whole province 1,732 square miles. Civil government was inaugurated in 1901. The inhabitants are nearly all Visayans, but there are over 2,000 Bicols and about 580 Tagalogs. Pop. of province 43,000; Masbate and Ticao (q.v.) 30,000.

MASBATE, Philippines, a pueblo and the capital of Masbate province, situated in the northeastern part of the island of Masbate on a peninsula dividing Palánog Port from Mobô Bay. It is a port of entry, and has a considerable trade. It has a church, a school and some well-constructed buildings. Pop. 2,900.

MASCAGNI, Pietro, pē'ā-trō mäs-kän'yē, Italian composer: b. Leghorn, Tuscany, 7 Dec. 1863. He was educated at the Milan Conservatoire and in 1890 his opera 'Cavalleria Rusticana' brought him immediate recognition in the musical world. From 1895 to 1903 he was director of the Rossini Lyceum at Pesaro. His songs and ballads are popular and his successful career as a composer has been further aided by his operas 'L'Amico Fritz' (1891); 'Les Rantzau' (1893); 'Iris' (1898); 'Le Maschere' (1901); 'Amica' (1905); 'Isobel' (1911); 'Parisina' (1913); 'L'Alodoletta' (1915), etc. In 1902 he visited the United States on an operatic tour. Consult Bastianelli, G., 'Pietro Mascagni' (Naples 1910), and Pompei, E., 'Mascagni nella vita e nel arte' (Rome 1912).

MASCAGNITE, mäs-kän'yīt, or **MASCAGNINE,** a native sulphate of ammonium, occurring notably at Sasso in Tuscany, where it was discovered by Mascagni, from whom it was named.

MASCARA, Algeria, fortified town and capital of an arrondissement in the province of Oran, 45 miles southeast of the city of that name, at the base of the Little Atlas Range. The town stands on the site of a Roman colony, is surrounded by walls, but has few ancient remains. It is purely of the French colonial type. For two centuries down to 1800 it was the capital of a Turkish beylik; in 1832 it became the capital of Abd-el-Kader; in 1835 it was ravaged by the French, but was reoccupied by Abd-el-Kader in 1838 only to fall finally to the French in 1841. Wine, cereals and oil are the principal items of trade. Pop. 24,250.

MASCARENE (mäs-kạ-rēn') **ISLANDS,** a collective name for the islands of Bourbon, Mauritius and Rodriguez, named after Mascarenhas, a Portuguese navigator, who discovered Bourbon in 1545.

MASCARON, Jules, French preacher: b. Marseilles, 1634; d. Agen, 1703. He became a member of the Congregation of the Oratory and soon established a great reputation as a preacher in the provincial cities. He preached at court in 1666 and thereafter he was a favorite of Louis XIV. Mascaron was consecrated bishop of Tulle in 1671 and eight years later was translated to the more important diocese of Agan. He still continued to preach at court and in 1675 delivered his greatest oration at the funeral of Marshal Turenne. His principal sermons were edited by a member of the congregation, Father Borde, in 1704. Consult 'Œuvres de Mascaron' (Paris 1828).

MASCART, Eleuthère Elie Nicolas, French physicist: b. Quarouble, Nord, 1837; d. 1908. He received his education at the École Normale Supérieure and in 1872 became professor at the Collège de France. From 1878 to 1907 he was director of the Government Central

Meteorological Bureau. He was also member of the International Bureau of Weights and Measures; was elected to the Academy of Sciences in 1884 and became its president in 1904. He was made commander of the Legion of Honor in 1889. Mascart's investigations were mainly confined to spectroscopy, electricity and terrestrial magnetism. He published 'Eléments de mécanique' (1866); 'Traité d'électricité statique' (1876); 'Leçons sur l'electricité et le magnétisme,' with Joubert (1882); 'Méthode de mesures et applications' (1882); 'Traité d'optique' (1889); 'Traité de magnétisme terrestre' (1900).

MASCHERONIANA. The 'Mascheroniana' of Vincenzo Monti (1754–1826) is an unfinished epic "vision" in five cantos of *terza rima.* It represents the third of four periods into which Monti's intellectual and artistic life may be divided. The first is the period of the Arcadian lyrics and the tragedies; the second that of the 'Bassvilliana' (1793), a diatribe against the French Terror; the third, that of the Napoleonic poems, the 'Prometeo' (1797), the 'Mascheroniana' (1801) and the 'Bard of the Black Forest' (1806); the fourth (1815–19) that of the "Austrian" poems, the 'Mystic May,' the 'Return of Astrea', the 'Invitation to Pallas,' the classic translations and the critical works.

Monti's permanent and most interesting distinction is that, as a man thoroughly permeated with the culture and mental traits of the Old Régime, he lived through the Revolutionary period without understanding any aspect of it. In the course of his life he assumed with equal sincerity the position of each dominant party. He assailed the Revolution and then accepted it. He hailed Napoleon the liberator, and then Napoleon the despot. Italians like to find in all these gyrations a thread of consistency: the concept of resurrected Italy. Unfortunately, however, Monti also embraced and sang the Austrian restoration.

This mental confusion, not to say moral perversity, has its counterpart in Monti's poetry. He is fundamentally an Arcadian, who vaguely perceives the emotions and the character of a new age, without visualizing them clearly as an artist and without finding for them an appropriate formal expression. In a sense this makes his poems extremely interesting; for wholly in the Arcadian manner, they are admirably calculated to show the limitations of that manner. The 'Mascheroniana,' which owes its popularity in Italy to its nationalistic spirit, aims to project the miserable Italy of the revolution upon the great Italy of the past and a greater Italy of the future, of which to be sure Napoleon is to be the artisan. Here is a trite theme but one of potentiality. Monti, however, being Monti, transports it into the Arcadian world, a world by itself, apart from, perhaps superior to, any real world. It becomes "literature" through "plot" and "form." As regards plot, Monti invents a vision of the Dante series: to commemorate a friend, he narrates the passing of the soul of Lorenzo Mascheroni, an eminent mathematician, from earth to heaven, bringing him, en route, in touch with the souls of Parini, Beccaria and others. These great Italians discourse on contemporary and past Italian conditions. Critics who like "literature" find, in the elaborate descriptions here, distinguished merits of vivacity and coloring. Then, as we pass to "form," we get a wealth of allusion, classic and Italian; but especially great ingeniousness of metaphor, and a truly remarkable success in epigram and sententiousness. Here, indeed, we find those traits which give Monti kinship with the greatest writers and which by themselves give the 'Mascheroniana' a place in literary history. But that is all. Monti cannot solve the neo-classic paradox: he cannot bring his virtual poetic theme (nationalism or patriotism) into contact with his "plot" and his "form." The theme remains undeveloped, and the plot and the form without poetic life. When Monti, for instance, wishes to denounce Robespierre, he pictures God shuddering on his throne and the angels gracefully hiding very beautiful heads under very beautiful wings. All this has nothing to do with Robespierre. The vice of neo-classicism is that it works on three parallel lines, one for the "plot," another for the "form" (figure, allusion, episode, metaphor); and another for the animating poetic emotion. And the lines never meet. The 'Mascheroniana' is a classic poem; and it died, as a poem, with the school it represents, retaining an historical interest, for its characteristic defects, and as one of the records of Monti's intellectual reversals.

ARTHUR LIVINGSTON.

MASCOTS AND HOODOOS, a mascot is a person or thing supposed to bring good luck, while a hoodoo is an influence of evil. Another name for the hoodoo is Jonah, a term originating with superstitious sailors. The word mascot was first introduced into literature by means of the comic opera 'La Mascotte' written by Audran, but in France it appears to have been in common use for a long time previously among gamesters and sporting characters. It was used to signify some object, animate or inanimate, which like the luck-penny brought good fortune to its possessor. The word is traced back to the *patois* of Provence and Gascony, where a mascot is something which brings luck to a household. Etymologically the word is derived from masque (masked or concealed), which in provincial French is applied — as *né coiffé* is in more polished French — to a child born with a caul. Such a child was believed to be destined, not only to be lucky himself, but to be the source of luck to others. In most European countries there is a large trade in charms and talismans to bring good fortune.

The term hoodoo is a manifest corruption of African voodooism and is a modified superstition of the system of terrorism which has been cultivated for years by the voodoo priesthood with remarkable success. There is, however, no scientific foundation for belief in either hoodoos or mascots, any more than there is in a reliance upon dreams and visions. Natural laws are not to be set aside by touching a hunchback or carrying a rabbit's foot in one's pocket. It is a fact, however, that in every age of the world the goddess of chance has been worshipped under one name or another, and modern civilization has not destroyed this cult. The belief in the mascot for luck, or the hoodoo for ill-luck, is an indication of weakness and lack of decision. In the 'Iliad,' when Hector is told that "the birds are against him," and all the omens unlucky, the Trojan hero makes answer:

«Without a bird his sword the true man draws; and asks no omen but his country's cause.» See also OMEN; SUPERSTITION.

MASCOUTEN, a belligerent tribe of Algonquians, the French *Nation du Feu,* «Fire Nation,» dwelling along the Illinois River. They were at constant warfare with their neighbors, and are first mentioned by the earliest French missionaries as inhabiting southern Michigan, whence, according to the traditions of the Ojibwas and Ottawas, they had been driven by the latter from the region around modern Mackinaw. In 1712, united with the Foxes and Kickapoo, they were almost exterminated, first by the French and afterward by the Pottawattomi and their allies. The remnants migrated westward and are last mentioned in 1779 as living with the Piankishaws and Kickapoos on the Wabash River. The name is derived from Mashkodainsug, «little prairie people,» a title now borne by a tribe of Pottawattomi Indians resident in Kansas.

MASEFIELD, John, English poet and dramatist: b. 1875. In his youth he shipped before the mast on the *Conway,* in which he made several voyages. For a time also he was engaged as a farm laborer and in the 90's spent a short time as attendant in a Sixth avenue saloon in New York. These early experiences he later turned to account in his literary work. After his wanderings Masefield settled near London and became a regular contributor of prose and verse to the periodicals of the metropolis. He was awarded the Edmond de Polignac prize for poetry in 1912 by the Royal Society of Literature. Masefield won literary fame mainly through his sea ballads and the narrative poems, 'The Everlasting Mercy' and 'The Widow in the Bye Street.' His verse is intensely realistic, full of pathos, although the verse form is often crude. His stories for boys represent his best efforts in prose and are reminiscent of Marryat at his best. His plays lack technique and are little suited to stage presentation, but give evidence of growing power. His works, in addition to those already mentioned, are 'Salt Water Ballads' (1902); 'A Mainsail Haul' (1905; 1913); 'A Tarpaulin Master'; 'Ballads'; 'Captain Margaret'; 'The Tragedy of Nan and other Plays' (1910); 'The Tragedy of Pompey the Great' (1910); 'Multitude and Solitude'; 'The Street of To-day'; 'Poems and Ballads'; 'William Shakespeare'; 'Dauber'; 'The Daffodil Fields'; 'Philip the King' (1914); 'Personal Recollections of John M. Synge'; 'The Faithful'; 'Sonnets and Poems'; 'The Locked Chest'; 'The Sweeps of Ninety-Eight'; 'Good Friday'; 'Gallipoli'; 'Lollingdon Downs,' etc. Masefield edited 'The Voyages of Captain William Dampier' (1906); and wrote introductions to 'Hakluyt's Voyages' and 'The Voyages of Marco Polo.' The following plays have been produced: 'The Campden Wonder'; 'Nan'; 'Pompey the Great'; 'Sweeps of Ninety-Eight'; 'Philip the King'; 'The Faithful'; 'Mrs. Harrison'; 'Good Friday.'

MASHAM, Abigail Hill, LADY, confidante and favorite of Queen Anne of England: b. London, 1670; d. 6 Dec. 1734. A cousin of Sarah Jennings, Duchess of Marlborough, and also related to Robert Harley, Earl of Oxford, she passed from the service of Lady Rivers, thanks to the influence of the Duchess of Marlborough, into that of Queen Anne, in whose favor she soon displaced her cousin, making every effort to turn the queen from the Marlboroughs and Whiggery to Toryism and even Jacobitism. She was married to Samuel Masham in 1707; had him made a baron in 1712; brought her kinsman Oxford into power, but soon turned him out; and, in short, was the power behind the throne, succeeding her cousin Marlborough. She retired after Queen Anne's death. She was a plain, homely, red-nosed woman, much bepraised by Swift and accused of vulgarity, meanness and covetousness by the Whigs. See ANNE, QUEEN OF ENGLAND.

MASHAM, Samuel Cunliffe Lister, 1ST BARON, English inventor: b. Calverly Hall, near Bradford, 1 Jan. 1815; d. Swinton Park, York, 2 Feb. 1906. In 1838 his father started Samuel and his brother John as worsted manufacturers in a mill at Manningham. About 1845 he perfected a wool-combing machine which revolutionized textile processes and made the inventor wealthy. He secured a profit of $5,000 on every machine sold. From 1855 to 1864 he spent huge sums in perfecting a silk-combing machine and at one time was perilously near bankruptcy. The machine was brought out in 1864 and enabled him to produce valuable yarn from the hitherto useless silk waste. Masham also perfected a velvet loom for piled fabrics, and after 1878 his income from his inventions exceeded $1,000,000 annually. He opposed free-trade because the American protective tariff seriously limited his business. He was created 1st Baron Masham in 1891. He wrote 'Lord Masham's Inventions' (1905).

MASHKODAINSUG. See MASCOUTEN.

MASHONALAND, mą-shō'ną-länd, South Africa, a province forming the northeastern portion of South Rhodesia, between the Zambesi and Matabeleland. It consists largely of open plains and table-lands, is well watered by the Umniate and other feeders of the Zambesi and is very fertile. The Mashonas belong to the Kaffir race and were formerly masters of the whole territory between the Limpopo and the Zambesi, but were cooped up within their present territory by the powerful Matabele, whom they were unable successfully to resist. They are a peaceful people, clever as smiths and as weavers of cotton fabrics. The country came under the management of the British South Africa Company in 1890. It is rich in gold, which has been mined here at some remote and unknown period, old workings being still visible, and Mashonaland is with some degree of probability identified with the biblical Land of Ophir. Salisbury is the chief town. The population of Mashonaland is estimated at 12,600 whites and 495,450 natives. Other towns are Hartley, Gatuma, Umtali and Victoria. Salisbury is connected with Beira, Portuguese East Africa, by a railroad. From Salisbury north another railroad extends 580 miles through Buluwayo to the Victoria Falls, where there is a new bridge over the Zambesi. This road is a section of the Cape to Cairo Railway. For the antiquities, anthropology, history, etc., of Mashonaland, consult Bent, J. T., 'Ruined Cities of Mashonaland' (London 1892); Hall, R. N., 'Prehistoric Rhodesia' (Chicago 1910); id., 'Great Zimbabwe' (London 1905); Darter, A., 'Pioneers of Ma-

shonaland' (ib. 1914); Randall-MacIver, D., 'Mediæval Rhodesia' (ib. 1906); Selous, F. C., 'Travel and Adventure in South-East Africa' (London 1893); Waal, D. C., 'With Rhodes in Mashonaland' (Cape Town 1896).

MASHPEE, a New England Indian group, originally located in Barnstable County, Mass. They were placed on a reservation as early as 1660. At present there are about 200 individuals of pure Indian descent and many more of mixed negro, white and Indian blood.

MASINISSA, măs-ĭ-nĭs'ą, or **MASSINISSA,** king of Numidia: b. 238 B.C.; d. 148 B.C. He was at first ruler only of the east portion of the country, but latterly of the whole, having, by the help of the Romans during the Second Punic War, defeated Syphax, king of Western Numidia, taking him prisoner with his wife, Sophonisba, whose hand had formerly been promised to Masinissa. Masinissa now made her his wife, but Scipio Africanus, fearful of her influence, claimed her as a prisoner of Rome. Unable to resist, Masinissa sent her a poisoned chalice, of which she voluntarily drank. Masinissa commanded the Roman cavalry on the right wing at the battle of Zama, which ended the Second Punic War (201 B.C.). As a reward the Romans gave him the territory formerly held by Syphax. In peace he proved himself an efficient administrator and did much to civilize his people. His army and fleet attained large proportions and he made raids into Carthaginian territory. In 150 B.C. Carthage made war on him, but with the Romans as his allies, Carthage fell to rise no more. Consult Meltzer-Kahrstedt, 'Geschichte der Karthager' (Vol. III, Berlin 1913).

MASK, a covering for the face, often shaped so as to form a rude representation of human or animal features. They have been in use from the most ancient times. Among the Greeks they were used, particularly in the processions and ceremonies attending the orgies of Dionysus. Some ancient masks seem to have been, like the modern ones, merely coverings for the face, but it was more usual for them to cover the whole head, and represent, with the features, the head, hair and eyes. They were at first made of the bark of trees, then of leather, afterward of wood, which the artist fashioned according to the design of the poet. The comic masks were distinguished by a grotesque, laughing countenance; the tragic ones had more dignity, but were sometimes frightful. There were also satyr masks and orchestric, or those with regular features, for dancers. They had mostly very large open mouths, within which were metallic bars or other sounding bodies to strengthen the voice of the speaker — a contrivance which was required by the construction and immense size of the old theatres. The mask used at modern masked balls or masquerades is a covering for the head and face made from a light stuff, with which a person may disguise himself and remain unknown, or perhaps represent some other character. There are whole and half masks — for example, masks for the nose and the eyes. A death mask is one of plaster made of the face after death. See also CARNIVAL; MASQUERADE, and consult Dall, 'Masks, Labrets and Certain Aboriginal Customs' (Washington 1885); Hart, C. H. (ed.), 'Brouwere's Life Masks of Great Americans' (New York 1899); Fichorini, 'Le maschere sceniche e le figure comiche d' antichi Romani' (Rome 1736).

MASKEGON (swamp people), a remnant of a tribe of Indians, part of the old Algonquin stock, who formerly lived by hunting and fishing. They are now in the "swamp region" of Canada, between Hudson Bay and Lake Winnipeg, and are classed with the Cree and Ojibwa people. To some extent they are now engaged in lumbering and a few do some farming. The estimated number of Maskegons is 2,000.

MASKELL, William, English theologian: b. Bath, about 1814; d. Penzance, 12 April 1890. In 1836 he was graduated at University College, Oxford, and in 1837 took holy orders. He was named rector of Corscombe, Dorset, in 1842. During his five-year incumbency he made researches in Anglican Church history, the results of which he embodied in 'Ancient Liturgy of the Church of England' (1844); 'History of the Martin Marprelate Controversy' (1845) and 'Monumenta Ritualia Ecclesiæ Anglicanæ' (1846). In 1847 Dr. Maskell was appointed vicar of Saint Mary's, near Torquay, and domestic chaplain to the bishop of Exeter. About this time appeared his 'Holy Baptism' (1848) and 'Enquiry into the Doctrine of the Church of England upon Absolution' (1849). Maskell took part with his bishop in the Gorham controversy, and disgusted at the vacillation of the bishops and their attitude on the question of the sacramental grace of baptism, with Manning he went over to the Roman Catholic Church. In 1850 he issued two letters to the Privy Council on 'The Present Position of the High Church Party.' Other works by him are 'Protestant Ritualists' (1872) and 'Ivories, Ancient and Mediæval' (1875). He never took orders in the Catholic Church but lived in retirement pursuing his historical researches.

MASKELYNE, măs'kĕ-lin, **Nevil,** English astronomer and mathematician: b. London, 6 Oct. 1732; d. Greenwich, 9 Feb. 1811. He was educated at Westminster School and at Trinity College, Cambridge; devoted himself to astronomy; and in 1765 was appointed astronomer royal and director of Greenwich Observatory. He made careful studies of terrestrial density, introduced into navigation the method of taking longitudes by lunar distances and made many improvements in astronomical apparatus. In 1767 he founded the *Nautical Almanac.* He wrote 'British Mariner's Guide' (1763) and 'Astronomical Observations' (1765).

MASKINONGE, or **MUSKELLUNGE,** the giant pike (*Esox nobilior*) belonging to the Esocidæ or pike family. It is found in the Saint Lawrence River, Lake Champlain, the Great Lakes and in the waters of western Canada. This fish is the largest of the pike family and, being predaceous, is not favored in most localities, as other fish soon disappear after its introduction. The name is applied to smaller but closely related species, of which the lake pickerel is one of the most common. The maskinonge reaches a length of from four to eight feet and a weight of from 40 to 100 pounds. It is caught with a hook and being swift and strong and a redoubtable fighter it is highly prized by anglers. Its color is a

dark gray, sides of a silver gray with black spots of unequal size and spotted fins.

MASÓ Y MARQUEZ, Bartolomé, Cuban patriot: b. near Manzanillo, 1834; d. 1907. His education was received in France and on his return to Cuba he became a planter, in which avocation he amassed considerable wealth. In the Ten Years' War (1868–78), he espoused the patriot cause and became colonel in the Cuban patriot army. He was made superintendent-general of the treasury and rendered efficient service under the Palma régime. He was imprisoned by the Spaniards after the war, but in 1883 returned to his plantation where he remained until the Insurrection of 1895. In September he became vice-president of the insurrectionary government and two years later became its president. In 1901 he was considered again for the Presidency and opposed Palma. Masó y Marquez opposed the Platt amendment as a denial of Cuban sovereignty and went before the electorate on this platform, but withdrew before the day of election because of alleged fraud in Palma's campaign.

MASOCHISM, a term used in analytic psychology to denote a tendency, usual in infancy and early childhood but outgrown or sublimated in later life, to take pleasure in having pain inflicted upon oneself. The term is derived from von Sacher-*Masoch,* an Austrian novelist, in whose stories many of the main characters exhibited this trait in an excessive degree. A mild degree of masochism is evinced by many average men and women, particularly those who spend much of their time complaining about wrongs, injuries, pains, etc., suffered by themselves, the inference being that their unconscious masochism drives them to be occupied mentally with pain and the details of its effect upon themselves. Many of the temperamental pessimists of the world afford examples of an imperfectly sublimated masochism (see SUBLIMATION), and if preponderating in the characterological make-up of the individual suggests a certain degree of disease, which it would be most advisable for such persons to get rid of.

MASON, mā'sŏn, **Alfred Edward Woodley,** English novelist: b. 7 May 1865. He was educated at Oxford and among his works, the majority of which have been reprinted in the United States, are 'A Romance of Wastdale' (1895); 'The Courtship of Morrice Buckler' (1896, dramatized 1897); 'The Philanderers' (1897); 'Lawrence Clavering' (1897); 'Miranda of the Balcony' (1899, dramatized in New York 1901); 'The Watchers' (1899); 'Clementina' (1901); 'The Four Feathers' (1902); 'The Truants' (1904); 'Running Water' (1907); 'The Broken Road' (1907); 'At the Villa Rose' (1910); 'The Turnstile' (1912). His plays include 'Colonel Smith' (1909); 'The Witness for the Defense' (1911); 'Open Windows' (1913).

MASON, Charles, English astronomer and surveyor: b. England, about 1730; d. Philadelphia, February 1787. He was for years assistant astronomer at the Greenwich Observatory and was sent on various expeditions in the service of science. In 1763 he was employed with Jeremiah Dixon to survey the boundary line between Maryland and Pennsylvania and they were engaged in this undertaking until 1767, the line established becoming famous in American history as the "Mason and Dixon's Line". They returned to England and Mason was thereafter engaged in astronomical observations and researches until the time, the precise date of which is not known, when he returned to America. His work upon the lunar tables of Tobias Mayer which were published in London in 1787 under the title 'Mayer's Lunar Tables Improved by Charles Mason,' enjoyed a high reputation for reliability. In 1860 many of his papers were accidentally discovered at Halifax, N. S. Consult Bliss, Porter C. (in *Historical Magazine* July 1861).

MASON, Daniel Gregory, American composer and writer on music: b. Brookline, Mass., 20 Nov. 1873. In 1895 he was graduated at Harvard University; he studied music in Boston, New York and Paris. He is assistant professor of music at Columbia University and is well known as a lecturer on music. His compositions include an elegy for piano (1901); sonata for violin and piano (1912); pastorale for violin, clarinet and piano (1913); and 'Country Pictures' for piano (1913); quartet for piano and strings (1914); symphony (1915). He has published 'From Grieg to Brahms' (1902); 'Beethoven and his Forerunners' (1904); 'The Romantic Composers' (1906); 'Students' Guide to Music' (1909); 'A Neglected Sense in Piano Playing' (1912); 'Music as an International Language' (1913); 'Guide to Music' (1914).

MASON, Francis, American missionary and Orientalist: b. York, England, 2 April 1799; d. Rangoon, Burma, 3 March 1874. He was the son of a shoemaker; studied by himself; came to the United States in 1818; worked as a shoemaker through Massachusetts; prepared for the ministry at Newton Theological Seminary; joined the Baptist Church in 1825; and in 1827 was licensed to preach; sailed for Burma in 1830; and settled in Tavoy, where he worked for 22 years. He was a brilliant linguist; reduced two Karen dialects to writing; and in 1853, upon his removal to Toungoo, published a Karen version of the Bible. He made special study of Pali literature and of physical and ethnical peculiarities of Burma, publishing in 1852 'Tenasserim, or the Fauna, Flora, Minerals and Nations of British Burma and Pegu' (revised 1860; 3d ed., 2 vols., by Theobald 1883). His other works include 'Life of the Karen Apostle,' a memoir of his wife (1847); 'Memoir of San Quala' (1850); 'Pali Grammar' (1868); and 'The Story of a Workingman's Life, with Sketches of Travel,' an autobiography (1870).

MASON, George, American statesman: b. Stafford (now Fairfax) County, in the "Northern Neck" of Virginia, 1725; d. 7 Oct. 1792. He spent his early life on a typical plantation. The same region produced his coworkers in the cause of the American Revolution, Richard Henry Lee and George Washington (qq.v.). Mason seems to have been tutored at home, being grounded in a knowledge of the classics, both Latin and English. His younger brother, Thomas, was sent to London to study law at the Middle Temple. George Mason was married in 1750 to Ann Eilbeck, who died in 1773. Of this union there were several children. He was married again in 1780 to Sarah

Brent. The family, after 1758, resided at "Gunston Hall," in Stafford County, a famous seat still standing on the banks of the Potomac. His energies were given to extensive planting interests.

As a member of the Ohio company, he was identified with his neighbor, George Washington, in the initial stages of the French and Indian War, growing out of the concerns of that company. In 1759 he entered the Virginia house of burgesses, at the same time with Washington. He early protested against slavery. In 1765 he wrote: "The policy of encouraging the importation of free people and discouraging that of slaves has never been duly considered in this colony, or we should not at this day see one-half of our best lands in most parts of the country remain unsettled and the other cultivated with slaves; not to mention the ill effects such a practice has upon the morals and the manners of our people." He drafted the "Non-Importation Association," which George Washington presented in 1769 in Williamsburg, and the "Resolves" adopted at a general meeting of the freeholders of Fairfax County, 18 July 1774. These "Resolves" urged "that a Congress should be appointed to consist of deputies from all the colonies, to concert a general and uniform plan for the defense and preservation of our common rights"; and "that during our present difficulties and distress, no slaves ought to be imported into any of the British colonies on this continent; and we take this opportunity of declaring our most earnest wishes to see an entire stop forever put to such a wicked, cruel and unnatural trade." Sparks says of these Fairfax resolves that "they constitute one of the ablest and most luminous expositions of the points at issue between Great Britain and the colonies which are to be found among the public documents of that period. Embracing the great principles and facts, clothed in a nervous and appropriate style, they are equally marked with dignity, firmness, intelligence and wisdom." These "Resolves" served as the basis of the association formed by the Virginia Convention of August 1774 and that of the general Congress at its first session the following September.

He was a member of the Virginia Convention held in Richmond, July 1775, which took measures to arm the colony and appointed a committee of safety. He declined appointment in Congress as Virginia's representative in the seat made vacant by Washington's acceptance of the command of the American forces. The mind of Mason was dominant in the Virginia Convention of 1776, so creative in State and National policies. He was the author of the Virginia Declaration of Rights, adopted by the convention on 12 June 1776. (See VIRGINIA CONVENTION OF THE REVOLUTION). A copy of the first draft of this historic paper, in the handwriting of George Mason, is to be seen in the Virginia State Library. At the foot of the manuscript the author added these words: "This Declaration of Rights was the first in America; it received few alterations or additions in the Virginia Convention (some of them not for the better), and was afterward closely imitated by the other United States." The small table upon which it is believed Mason wrote this "Declaration" is preserved at the Virginia Historical Society in Richmond. Mason's chaste and concise statement of the fundamental principles of free government deserves to rank with the foremost political charters of the English-speaking world. James Madison styles him "the master-builder of the Constitution" of Virginia, adopted 29 June 1776, the natal day of the commonwealth.

Mason was a member of the Virginia assembly from 1776 to 1780, and from 1786 to 1788. He was one of the committee to revise the laws of Virginia, in accordance with the changed political conditions. The other members of this committee were Thomas Jefferson, Edmund Pendleton, George Wythe and Thomas Ludwell Lee. Mason again declined a seat in Congress, to which he was elected by the Virginia assembly on 22 May 1777.

Mason took an active part in the Constitutional Convention of 1787, reaching Philadelphia 17 May. He urged that the President be elected by Congress, and that he be ineligible for a second term; that the States should have equal representation in the Senate; that the Supreme Court should be joined with the Executive in the exercise of the veto power; that Congress be empowered to enact sumptuary laws; "that no law in the nature of a Navigation Act be passed before the year 1808, without the consent of two-thirds of each branch of the Legislature"; and, finally, that Congress should be given the control of slavery. Madison reports Mason's speech in favor of giving Congress the control of slavery as follows: "This infernal traffic originated in the avarice of British merchants. The British government constantly checked the attempts of Virginia to put a stop to it. The present question concerns not the importing States alone, but the whole Union. . . . Slavery discourages arts and manufactures. The poor depise labor when performed by slaves. They prevent the emigration of whites, who really enrich and strengthen a country. They produce the most pernicious effect on manners. Every master of slaves is born a petty tyrant. They bring the judgment of heaven on a country. As nations cannot be rewarded or punished in the next world, they must be in this. By an inevitable chain of causes and effects, Providence punishes national sins by national calamities. He lamented that some of our eastern brethren had, from a lust of gain, embarked in this nefarious traffic . . . He held it essential in every point of view, that the General Government should have power to prevent the increase of slavery."

It was chiefly the failure to insert his views as to Congressional control of slavery and Navigation Acts which led Mason to reject the Constitution. Shortly before his death he told Thomas Jefferson that "the Constitution as agreed to for a fortnight before the Convention rose was such a one as he would have set his hand and heart to. . . . With respect to the importation of slaves, it was left to Congress. This disturbed the two southernmost States who knew that Congress would immediately suppress the importation of slaves. Those two States, therefore, struck up a bargain with the three New England States, that if they would join to admit slaves for some years, the two southernmost States would join in changing the clause which required two-thirds of the Legislature in any vote. It was done.

. . . Under the coalition, the great principles of the Constitution were changed in the last days of the Convention.» Such was Mason's own explanation of his refusal to sign the instrument in Philadelphia and for his stalwart opposition to its ratification in the Virginia Convention, which met at Richmond in 1788. Two years later he declined an appointment to a vacancy in the United States Senate. He died at «Gunston Hall,» where he lies buried. Mason's statue forms one of the circle of the Revolutionary fathers surrounding the equestrian monument of Washington at Richmond.

Thomas Jefferson described George Mason as «a man of the first order of wisdom among those who acted on the theatre of the Revolution, of expansive mind, profound judgment, cogent in argument, learned in the lore of our former Constitution, and earnest for the Republican change on Democratic principles. His elocution was neither flowing nor smooth, but his language was strong, his manner most impressive and strengthened by a dash of biting cynicism when provocation made it seasonable.» Consult Rowland, 'Life and Writings of George Mason' (2 vols., New York 1892).

MASON, James Murray, American legislator: b. Mason's Island, Fairfax County, Va., 3 Nov. 1798; d. near Alexandria, Va., 28 April 1871. He was graduated from the University of Pennsylvania in 1818, studied law and upon being admitted to the bar established a practice at Winchester, Va. He was in public office much of the time and in 1847 was elected to the United States Senate, representing Virginia, where he proved a consistent and strong adherent to the policies favored by his State. He was the author of the Fugitive Slave Law of 1850 and at the outbreak of the Civil War he resigned his seat in the Senate to enter the service of the Confederacy. He was sent to England with Slidell as Confederate commissioner, but was captured on the steamer *Trent* (see TRENT AFFAIR, THE) and taken to Boston where he was confined in Fort Warren until 1862 when he sailed for Europe and until the end of the war endeavored to secure recognition of the Confederacy. After the war Mason lived in Canada until 1868, being in fear of the Federal government, but returned to Virginia some years before his death.

MASON, Jeremiah, American lawyer and politician: b. Lebanon, Conn., 27 April 1768; d. Boston, 14 Oct. 1848. He was graduated at Yale in 1788, admitted to the bar in 1791, and began to practise law at Westmoreland, N. H. In 1794 he removed to Walpole, N. H., and in 1797 settled at Portsmouth, where he lived for 35 years. At the New Hampshire bar, then the most famous in the country, Mason soon reached pre-eminence, among his fellow members being Daniel Webster and Jeremiah Smith. In 1802 Mason was appointed attorney-general of New Hampshire and in 1813 became a United States senator. He was a strong Federalist and took a leading part in the senatorial debates on matters relating to the War of 1812, his speech on the Embargo, delivered in 1814, and that on the Conscription Bill, 1815, being notable among public utterances of the time. In 1817 he resigned his seat to resume his practice, but afterward served for several terms as a member of the New Hampshire legislature and rendered great assistance in the codification of the State laws. He removed to Boston in 1832 and practised in the courts until he reached 70, when he retired, with reputation fully maintained, to the more private work of his profession.

MASON, John, American colonist, founder of New Hampshire: b. King's Lynn, Norfolk, England, 1586; d. London, December 1635. In 1610 he served in the navy against insurgents in the Hebrides; in 1616 went as governor to Newfoundland, of which, in 1620, he published a description and in 1626 a map. In 1617 he explored the coast of New England; obtained in 1622 a grant of region called Mariana (northeastern Massachusetts); in the same year, with Sir Ferdinando Gorges, procured a patent for the province of Maine; and in 1623 sent a colony to the Piscataqua River. In 1629 he obtained a patent for the New Hampshire colony, also taking one with Gorges for Laconia, a tract including Lake Champlain. Among various prominent positions which Mason held in England was that of judge in Hampshire 1635, and in the same year he was appointed vice-admiral of New England. In 1691 his rights in New England were sold to Gov. Samuel Allen. Mason was buried in Westminster Abbey. New Hampshire became a royal province 44 years after Mason's death. Consult Tuttle, 'Memoir of Captain John Mason, the Founder of New Hampshire,' in an edition of Mason's description of Newfoundland (Boston 1887).

MASON, John, American colonial commander: b. in England, about 1600; d. Norwich, Conn., 1672. Under Sir Thomas Fairfax he served in the Netherlands; in 1630 settled at Dorchester, Mass.; in 1633 was appointed to a military command at Boston; and two years later joined with others in founding Windsor, Conn. In 1637 he was given command of an expedition of English and Indians against the Pequots (q.v.), whom he almost annihilated, completing their destruction in a second movement a little later. He removed first to Saybrook, and afterward to Norwich. For 30 years he was a major of the Connecticut forces, was a magistrate for many years and deputy governor 1660–70. From 1642 to 1668 he served as judge of the colonial court. His 'Brief History of the Pequot War,' written at the request of the General Court, was reprinted by Increase Mather in his 'Relation of Trouble by the Indians' (1677, republished by Prince, Boston 1736). Consult Ellis, G. E., 'Life of John Mason of Connecticut' (in Sparks' 'Library of American Biography,' Vol. XIII, Boston 1864).

MASON, John Mitchell, American divine: b. New York, 19 March 1770; d. there, 26 Dec. 1829. His father was pastor of an Associate Reformed Church, and the son was graduated at Columbia College in 1789, and after studying theology under his father's care for one year went in 1791 to the University of Edinburgh. He was recalled in 1792 by intelligence of his father's death, and became his successor in his pastoral charge in 1793. He planned a theological seminary to be under the authority of his denomination, and visited Great Britain for the purpose of obtaining contributions; his pulpit efforts abroad gaining him repute there as one

of the first preachers of the time. The seminary being established in New York City in 1804, he was appointed its first professor of theology. In 1806 he projected the *Christian's Magazine*, which he conducted for several years, and in which he carried on a controversy with Bishop Hobart. In 1811 he became provost of Columbia College, and by his talents and energy raised that institution to a higher character than it had ever before possessed. In 1821 he exchanged his pastorate for the presidency of Dickinson College, Carlisle, Pa., and the next year entered the Presbyterian ministry. He was one of the great pulpit orators of his day and his discourses on the deaths of Washington (1800) and Hamilton (1804) are masterpieces of their kind. Consult the 'Life,' by Van Vechten (New York 1856).

MASON, John Young, American politician: b. Greensville, Sussex County, Va., 18 April 1799; d. Paris, 3 Oct. 1859. He was educated at the University of North Carolina; was admitted to the bar in 1819; became a judge in State and Federal courts; served several terms in the Virginia assembly; and from 1831 to 1837 was a member of Congress. Then till 1844 he was judge of the United States court for the district of Virginia, and in that year became Secretary of the Navy in the Cabinet of President Tyler. Although he served temporarily as Attorney-General under Polk, he re-entered the Navy Department. President Pierce, in 1853, appointed him Minister to France, and until his death he continued to fill this diplomatic position. With James Buchanan and Pierce Soulé (qq.v.) he signed the Ostend Manifesto (q.v.).

MASON, Sir Josiah, English pen manufacturer: b. Kidderminster, 23 Feb. 1795; d. 16 June 1881. He was the son of a carpet-weaver and at an early age began to earn his livelihood by hawking cakes and fruits in the streets. At Kidderminster he successively tried his hand at shoemaking, baking, carpentering, smithing, painting and weaving. In the midst of his avocations he taught himself to read and write. He removed to Birmingham in 1814 where he became a toymaker. He set up a shop of his own in 1824, turning out split key rings by machinery invented by himself; prospering in this venture he added the manufacture of steel pens in 1829. In the latter branch of industry he became the largest producer in England. In 1874 he transferred his interest to a limited liability company. Mason was also interested in electro-plating, copper smelting and india rubber ring manufacture with George R. Elkington. In 1860 he established a great orphanage at Erdington, upon which he expended $1,500,000. He was knighted in 1872. Mason College, now part of the University of Birmingham, was founded by him with an endowment of $1,000,000. Consult Bunce, J. T., 'Sir Josiah Mason: A Biography' (London 1882).

MASON, Lowell, American musician: b. Medfield, Norfolk County, Mass., 8 Jan. 1792; d. Orange, N. J., 11 Aug. 1872. His general education was small; in music he was self-instructed and wonderfully adept even when a boy, being choir leader in Medfield when 16, and a teacher in Savannah, where he removed in 1812. He came to Boston in 1827, was president of the Handel and Haydn Society there, and in 1832 founded the Boston Academy of Music. He visited Germany in 1837 in order to acquaint himself with improved methods in teaching music. In 1821 he published a collection of psalm tunes based on Gardiner's 'Sacred Melodies,' but including some of Mason's own compositions. He is best known for his hymn tunes, notably Cowper "There is a Fountain," and missionary hymn "From Greenland's Icy Mountains". Mason's more important publications were: 'Juvenile Psalmist' (1829); 'Lyra Sacra' (1837); 'The Psaltery' (1845); 'Carmina Sacra' (1841; new series 1852); 'Musical Letters from Abroad' (1853); 'Sabbath Hymn and Tune Book' (1859). Mason's musical library is now the property of Yale University.

MASON, Otis Tufton, American ethnologist: b. Eastport, Me., 10 April 1838; d. Washington, D. C., 5 Nov. 1908. He was graduated from Columbia University in 1861 and from 1861–84 was at the head of its preparatory school. From 1884–1908 he was curator of ethnology at the United States National Museum. He was a member of various scientific societies and published 'Cradles of the American Aborigines' (1889); 'Woman's Share in Primitive Culture' (1894); 'The Origin of Inventions' (1895); 'Indian Basketry' (2 vols., 1904). He was coeditor of the 'Standard Dictionary' and edited the anthropological department of the *American Naturalist*.

MASON, Rufus Ogden, American physician: b. Sullivan, N. H., 22 Jan. 1830; d. New York, 1903. He was graduated from Dartmouth College in 1854 and from the College of Physicians and Surgeons in New York in 1859. During the Civil War he was an acting assistant surgeon. He was almost as well known as an author as he was a physician and among his books are 'Sketches and Impressions, Musical, Theatrical and Social, Including a Sketch of the Philharmonic Society of New York' (1887); 'Telepathy and the Subliminal Self' (1897); 'Hypnotism and Suggestion in Therapeutics' (1901).

MASON, Stevens Thomson, American politician: b. Leesburg, Va., 27 Oct. 1811; d. New York City, 4 Jan. 1843. He was the son of Gen. John T. Mason of the noted Mason family of that State. He received his education at Transylvania University, Lexington, Ky., to which place his father had removed in 1814. On 12 July 1831, when not 20 years of age, he was appointed secretary and acting governor of the Territory of Michigan, a position he continued to occupy until 8 Sept. 1835. The death of George B. Porter, the territorial governor during his term, left Mason for several years the actual governor. Although vigorously opposed by the people of the Territory at the time of his appointment on account of his minority, his stand in the controversy with Ohio, known as the Toledo War, brought him such popularity that he was unanimously chosen governor by the people upon the adoption of the constitution by the State on 2 Nov. 1835, a position to which he was re-elected in November 1837. In 1840 he removed to New York City to take up the practice of law. On 4 June 1905, under the authority of the Michigan legislature, his remains were transported from New York

and reinterred in Capitol Park, Detroit, the site of the first capitol of the State.

He is known in the history of Michigan as the "Boy Governor," as he was the youngest person ever appointed to so important an executive position in the history of the nation.

MASON, William, English poet: b. Hull, 12 Feb. 1724; d. York, 7 April 1797. He was educated at Cambridge and his first publication was 'Isis,' a poem, satirizing the Jacobitism and High Church principles which prevailed in the University of Oxford. In 1752 he published 'Elfrida,' a tragedy, with choral odes, on the ancient Greek model. Having taken orders in the Church he obtained the living of Aston, in Yorkshire, and was appointed one of the royal chaplains. In 1759 appeared 'Caractacus,' a drama. Some years after Mason was made precentor and residentiary canon at York. One of his principal works, the 'English Garden,' a poem, appeared between 1772 and 1782, and was translated into French and German. In 1775 he published the poems of his friend Thomas Gray (q.v.) with memoirs of his life. His principal subsequent publications are 'Odes'; 'Life of William Whitehead,' with his poems (1788); 'Essay on Church Music' (1795). There is a tablet to his memory in the Poets' Corner, Westminster Abbey. In 1811 a complete edition of his works appeared.

MASON, William, American musician: b. Boston, 24 Jan. 1829; d. New York, 14 July 1908. He studied music in Germany under Moscheles, Hauptmann, Moritz, Dreyschock and Liszt; made tours as a pianist in Europe and the United States. In the year 1855, with Theodore Thomas and others, he established the Mason and Thomas recitals of chamber music, which were continued until 1868. His compositions, many in number, are mainly for the piano. He published 'Two Pianoforte Methods' (with E. S. Hoadley); 'Pianoforte Technics' (with W. S. B. Matthews); 'System for Beginners' (1871); 'Touch and Technics' (1878); 'Primer of Music' (1894); 'Memories of a Musical Life' (1901), etc.

MASON, William Ernest, American legislator: b. Franklinville, N. Y., 7 July 1850. He removed with his parents to Bentonsport, Iowa, in 1858, and after teaching school, 1866–70, was admitted to the bar and began practice in Chicago, Ill., in 1872. He was a member of the Illinois general assembly in 1879, of the State senate in 1881–85 and of Congress 1887–91. In 1897 he was elected United States senator, in which capacity he warmly advocated the cause of Cuban independence. He was elected to the 65th Congress (1917–19) and is senior member of the law firm of Mason and Mason, Chicago. He has published 'John the Unafraid' (1910).

MASON, Mich., city, county-seat of Ingham County, on the Michigan Central (Saginaw Branch) Railroad and the Michigan United Interurban, 12 miles south by east of Lansing. It was settled in 1839, in 1865 incorporated as a village and in 1875 chartered as a city. It is a residence city with good streets and pavements, cement walks and curbing, situated in a rich farming region. The grain elevators, cold storage, beanery, hay barns, cream and poultry stations, stockyards, lumber-yard and gravel pits are important resources. It is the home of several prize winners in Holstein exhibits and excels in fine horses. The principal buildings are the courthouse, schools with an annex, churches and fine homes. The city owns and operates the electric light and waterworks. Pop. 1,742.

MASON-BEES, a name given to the small wild bees of the genera *Osmia, Ceratosmia* and *Chalcidoma,* which construct their nests with sand or gravel, agglutinated together by means of a viscid saliva, and fix them on the side of walls, under stones, within the hollows of plant stems whence the pith has been removed, or avail themselves of some other cavity for that purpose. The mason-bees, like the carpenter-bees, leaf-cutters and other allied forms of the family *Megachilidæ,* are solitary in habits, not living in communities, although groups of cells are usually found near together, made by the same mother-bee, and each containing a single egg and food — a mixture of honey and pollen. Consult Howard, L. O., 'The Insect Book' (latest ed., New York 1914), which contains an extensive bibliography of the subject; id., 'Standard Natural History' (Vol. II, Boston 1884); Fabre, Henri, 'Insect Life' (English trans., London 1901); id., 'Mason Bees' (New York 1914).

MASON CITY, Iowa, city, county-seat of Cerro Gordo County, on the Chicago, Milwaukee and Saint Paul, the Chicago and Northwestern, the Minneapolis and Saint Louis and the Chicago, Rock Island and Pacific, also Mason City and Clear Lake Railway (Interurban) and the Chicago Greatwestern railroads, about 115 miles in direct line north by east of Des Moines. It was settled in 1855 and its present charter was granted in 1870. It is an agricultural and stock-raising region; fire-clay and valuable sandstone quarries are in the vicinity. Its chief industrial interests are connected with the manufacturing of sash and doors, brick and tile, cement — two large cement mills with a capacity of 11,000 barrels daily and lime, and the quarrying of sandstone. It has a large foundry and considerable trade in livestock and grain. The city is a trade centre and distributing point for a large section of country, and has several wholesale establishments. The government is on the commission plan and consists of three commissioners. The waterworks are owned and operated by the city. Pop. 17,221.

MASON AND DIXON LINE. See BOUNDARIES OF THE UNITED STATES.

MASONIC FRATERNITY, The, an organization of associated societies to which, by common consent, has been accorded the primacy among fraternal orders. Divided into groups of degrees, overlying one another like the foundation and superstructure of a symmetrical building, these constitute the three great rites of universal recognition, namely, English, American and Scottish Masonry. The first and second are acknowledged to compose the great Masonic institution as it exists in Great Britain and dependencies, and in the United States; while the elaborate Scottish Rite of 33 degrees, comprising a more limited membership therein, is the one most widely disseminated in other portions of the world. Each rite is complex in its inter-dependent system of government, and is essentially cosmopolitan, bearing upon its rolls the names of emperors, kings, princes,

presidents and governors, together with scholars, statesmen and men of affairs, as well as those of lesser stations in church and state. The full legal title is, "The Ancient and Honorable Fraternity of Free and Accepted Masons and Concordant Orders."

The Appeal to Antiquity.— During the 18th and first half of the 19th century Masonic writers laid great stress upon the possible origin of the society in the remote ages of the past. Absolutely without any historical basis of record as were most of these theories, yet men of learning loaned their influence to perpetuate the fables extant concerning the fraternity. Some asserted (*a*) that the history of the race was the story of Masonry, beginning with the migration from the Garden of Eden; others (*b*) that it sprang from the Patriarchal period; and still others contended (*c*) that the society was the successor of the ancient mysteries of the Orient; (*d*) that the Temple of Solomon was its cradle; (*e*) that the Crusaders and the Knights Templars carried it forward from their times; (*f*) that the Roman colleges of artificers and builders of the Middle Ages handed down the craft to posterity; (*g*) that the civil strifes in Great Britain of the 15th and 16th centuries, and subsequent political events, made the institution possible; (*h*) and a later class of writers placed its origin to the credit of the Rev. James Anderson, D.D., and the Rev. John Theophilus Desaguliers, LL.D., F.R.S., and their compeers of "The Revival of 1717 A.D." Several of these authors changed their views later in life; and, during the past 50 years, the intelligent Masons of Great Britain and the United States have attempted to build up from the broken fragments of the past,— contained in fugitive lodge records extending back nearly three centuries,— a reasonable history of the "operative" Masonry of the British Isles and the continent of Europe, as well as that of the present "speculative craft." In this effort assistance has been rendered by scholars not connected with the fraternity. The critical reader will note, in the enumeration above, that many plausible theories might be founded both on history and legend, but the strongest factor in the appeal to antiquity, nevertheless, is the "Legend of the Third Degree." In one form or another the allegory of the fall of man, the sacrificial redemption of the race, the doctrines of the resurrection and immortal life, permeated the peoples of every age and became the motive of many migrations. This fact is likewise of record,— established by the discoveries made in Bible lands during the 19th century,— dating four millenaries B.C. When, therefore, a society arose which claimed to solve some of these mysteries,— nay, even to have descended from those periods,— it is not singular that the cult should have attracted disciples; especially when shielded from public gaze by a veil of secrecy, the universality of the printed page not having yet been established!

In Great Britain and on the Continent.— The consensus of reliable historical opinion affirms that the premier Grand Lodge of England, organized 24 June 1717 A.D., is the mother of all regular Masonic lodges of the three craft degrees, and, therefore, peculiar interest centres in the landmarks, legends and authentic narratives pertaining to the English rite itself, as well as in the American rite, the daughter thereof, so to speak. The apocryphal history of Masonry recites that it was introduced into England by Prince Edwin, 926 A.D., and that lodges were "warranted at York," by King Athelstan. This "Legend of the Guild" and much other traditional story is based upon curious manuscripts called "Old Constitutions," or "Old Charges of British Freemasons." The oldest of these is dated, by English antiquaries, 1390 A.D., and is registered as the "Regius MS., or Halliwell Poem." The next in age,— beginning of the 15th century,— is called the "Matthew Cooke MS."— both in the British Museum. In that century, also, Henry VI asked, "Where did Masonry begin?" On being told that it began in the East, his next inquiry was, "Who did bring it westerly?"— and he received for answer, "the Phœnicians." These answers were predicated on the traditions of the order, as they had been transmitted from generation to generation. Many Freemasons believe this to be the true origin of their institution. Within recent years many more documents have been discovered and published in facsimile, so that the catalogue contains about 75 entries. These manuscripts have been grouped into families, because of certain characteristics common to two or more,— the whole forming a valuable collection of ancient Masonic remains. Each manuscript consists of three parts: (*a*) the introductory prayer, declaration or invocation; (*b*) the alleged history of the order, or the "Legend of the Guild"; (*c*) the peculiar statutes and duties, the regulations and observations, which Masons in general, or the craft as a unit, were bound carefully to uphold and inviolably to maintain. The precise value of the "Old Charges" lies in the fact that they were the formulas used in the ceremonies of initiation by our Masonic ancestors of from two to five centuries antecedent. All known copies are of English origin, even those used in Scotland; and, being of a distinctly Christian character, it has been thought they indicate ecclesiastical supervision and composition. A manuscript version of 1583 A.D., in possession of the United Grand Lodge of England, has the following "introductory prayer," and is quoted as an example:

> The mighte of the Father of Heaven and ye wysdome of ye glorious Soonne through ye grace & ye goodnes of ye holly ghoste, yt bee three psons & one God, be wh vs at or beginning and give vs grace so to govrne vs here in or lyving that wee maye come to his blisse that nevr shall have ending. AMEN.

Signs, tokens and words, by which the Masonic craft became differentiated from all other trades than builders, do not appear in the earlier forms. In time, however, this initiation was exclusively its own; and in the Melrose manuscript 1581 A.D. (known to posterity by the transcript of 1674), reference is made to "Ye privilidge of ye compass, square, levell, and ye plum-rule." The early records show that the lodge system was used from the first as a bond to preserve the art of building as a monopoly. The secret of the organization was then,— in contradistinction to all others,— "the way to build"; and tyled lodges contributed best toward this end. But, in spite of every precaution, another body of operatives arose,— called "Cowans" by the regulars,— which in spite of its lack of prestige, not being in possession of "Old

Charges» and the «mason's word,» contrived to prosper, eventually breaking down the monopoly and prepared the way for the «speculative» society of modern times. The term «speculative» has reference to a class of members who were not operatives and had no intention of becoming artisans, but were denominated «accepted» Masons. The admission of this element proved the wisdom of the fathers, and to it is probably due the permanency of the institution and its continuity to succeeding ages. By its influences the Masonic fraternity secured governmental favor and became «free of the guilds,» that is, free of the restrictive laws, which even now, regulate the «Friendly Societies» of the British Empire,—enjoying a liberty which did not inhere in the organization of exclusively operative masons who were not *Free*-Masons, the so-called «Cowans.» (Free + Mason, originally written as two words, not mentioned prior to the 14th century). Just what proportion of the membership was speculative during the earlier or operative period unfortunately is not known, the first lodge record preserved being of a meeting held «Vltimo, July 1599,» but of its mixed character there is no doubt. Old records, recently discovered, and examined in the light of present-day research, have led Masonic writers to revise the usually accepted assertion that the cathedrals and other public edifices in Great Britain, erected during the Middle Ages, were planned by Church dignitaries. The opinion now obtains that the architects thereof were the Master Masons of that period,—the divisions among the builders of the operative era being apprentices, journeymen (Fellow Crafts), and Master Masons. Each man's work bore a distinguishing mark by which the piece could be identified, and the wage scale regulated.

The Masonic «reformation» originated in London. By the dawn of the 18th century the decadence of the society had become so serious that four of the surviving lodges proceeded to a reorganization in 1717, and this movement is known in history as «The Revival.» These four lodges were probably joined by others, though the records do not exist. Two clergymen, James Anderson (b. Edinburgh, 5 Aug. 1684) and John Theophilus Desaguliers (b. France, 12 March 1683) became the architects and authors of the new régime. A distinguished gentleman named Anthony Sayer was installed as grand master. He was of the «speculative» and «accepted» class. The Grand Lodge instituted was a *governing* body, and in no wise a successor of the «General Assemblies» of the operative or legendary period. To Dr. Anderson was entrusted the duty of compiling the «general records and faithful traditions from the beginning of time,» and to enable him to do so all the available documents were collected for his use. These were afterward destroyed,—an irreparable loss. In 1723 the «New Constitutions» were published, when it was discovered that Drs. Anderson and Desaguliers had completely changed the theory of the institution,—from Christian to the adoption of a universal creed based on the Fatherhood of God and the Brotherhood of Man,—so as to admit men of all religions, nationalities and stations in life. These authors included likewise all that is now known of the transactions of the craft from 1717 to 1722 A.D., when the official records commence. The second edition of the «New Constitutions» was published in 1738, with «New Regulations» added, which became the basis of the Freemasonry of the present day. From 1717 the evolution of the society made rapid progress, both as to the increasing area of its operations, and in the multiplicity of its degrees. But the Masons of «the revival» and their immediate successors did not long dwell together in unity. Those at York organized a «Grand Lodge of All England» in 1725, and kept it alive for some 20 years. A reorganization took place in 1761, and the body ceased to exist in 1792, never having chartered lodges outside of England. In 1751 a great schism occurred, whereby a part of the premier Grand Lodge withdrew and instituted a rival. In common parlance the latter body became known as «ancients,» the former as «moderns,» a transposition which is firmly settled in history. A deputation from the Grand Lodge of All England, dated 29 March 1779, created still another body called the «Grand Lodge of England South of the River Trent,» and this survived until 2 May 1790. The two rival Grand Lodges,—«Moderns» and «Ancients,»—happily entered into a concordat on Saint John's Day, 27 Dec. 1813 A.D., constituting the present United Grand Lodge of England, declaring that the English Rite of Freemasonry «Consists of three degrees and no more, namely: those of the Entered Apprentice, the Fellow Craft, and the Master Mason, including the Supreme Order of the Holy Royal Arch.»

Scotland enjoys the honor of «Mother Kilwinning Lodge, No. 0,» universally recognized as the oldest in existence. Its records comprise a minute of 1599, and others ranging from 20 Dec. 1642 to 5 Dec. 1758, A.D., and these communications were held in Kilwinning. Traditional history ascribes to the architects of the abbey of Kilwinning the preeminence which inhered to the Masons of York, in England. A dozen other old lodges are of record, possessing fragmentary minutes and «Old Charges» of rare Masonic value, but the Scottish Craftsmen did not follow the examples set by England and Ireland until Saint Andrew's Day, 30 Nov. 1736 A.D., when Baron William St. Clair of Roslin (Earl of Orkney and Caithness), was chosen Grand Master. The following year he was succeeded by George, the third and last Earl of Cromarty. It will be noted that in Scotland, as well as in England and Ireland, the craft was patronized by those of exalted civil rank and station. Scotland's «Masonic gem» is the «Prentice's Pillar,» standing in the chancel of Roslin Chapel, Edinburgh.

In Ireland no Grand Lodge records are extant of date prior to 24 June 1780 A.D. It is known that there was a lodge at Cork, the first minute of which is dated «December ye 8th, 1726.» The city archives refer to a charter for a «Society of Freemasons,» and a «Grand Lodge of Munster»; and it is known that other lodges existed prior to 1726. There was also a Grand Lodge of Cork, and one at Dublin. The last named was of record in 1728–29; reorganized 1731 A.D., electing Lord Kingston, who is described as «Grand Master of all the lodges of Free Masons in the Kingdom of Ireland.» Irish Masons possessed «Old Charges,» and like their English brethern propagated the order far and wide. It was in Lodge No. 44, of Irish register,—warranted in 1735,—that the Hon. Mrs. Richard Aldworth (Eliza-

beth St. Leger), was initiated, and became the celebrated and only «Female Freemason» of history. She only received the first degree.

An attempt has been made to connect, historically, the building crafts of Continental Europe with the operative masons of Britain and Scotland. But, in Germany, in pre-Reformation times, the «Independent Stonemasons» arose, coming out from the monastic orders as the zeal for building magnificent edifices, under ecclesiastical patronage, declined. These «lay brothers» were possessed of «Old Charges,» but no authentic documents remain which refer to their most flourishing period of existence. Within the short space, however, of from 10 to 20 years, following the revival in England, Masonry of the British type had obtained a foothold in all the countries of Europe. It had crossed the sea to America, and in a list of lodges published in 1734, No. 126, of English register, is shown as located at «Boston, in New England,»—known since 5 March 1792 as Saint John's Lodge. «England became the great central point of Masonry for the whole world,» said Charles W. Moore, Grand Secretary of the Grand Lodge of Massachusetts, in an oration on 29 Dec. 1856 at Boston: «From this source have lodges, grand and subordinate, at various times, been established, and still exist and flourish—in France and Switzerland; in all the German states, save Austria (and there . . . for short seasons); all up and down the shores of the Rhine . . . Sweden, Denmark, Russia; in Italy and Spain (under cover of secrecy); in various parts of Asia; in Turkey; in Syria (as at Aleppo, where an English lodge was established more than a century ago); in all the East India settlements . . . in China . . . Africa; . . . in all the larger islands of the Pacific and Indian Oceans . . . Saint Helena, Mauritius, . . . Madagascar . . . Australia . . . New Zealand; in Greece . . . in Algeria, Tunis, Morocco—and wherever else in the Old World the genius of civilization has obtained a standpoint, or Christianity has erected the Banner of the Cross.» The speaker further enumerated the spread of the order in the West Indies, South America, Canada and the United States. In the 63 years which have elapsed since these words were uttered, the growth of Freemasonry has been still more extraordinary.

In France, Masonry has drifted away from the tenets preached and practised among the fraternity in other lands. All Masonic lodges throughout the world except the Grand Orient of France do homage to a Divine Being, symbolized as Horani, the Great Architect of the universe, and in the beginning the French lodge also recognized the designer of the Temple. But in 1877 the Grand Orient formally repudiated the Great Architect and atheism was made a condition of membership. The «Frères Trois Points,» as they are commonly called in France, the Brothers of the Three Dots (∴) were credited with all the revolutions of modern times. Petty ambitions and political intrigues made their homes in the lodges, and gradually it became impossible to succeed in business or public life without being affiliated, and everybody wished to join the omnipotent occult ring. The Grand Orient was threatened with losing its character of being a «serious» institution, and it was thoroughly defeated when it massed all its forces to oppose the election of General Boulanger in 1888. The Confédération Générale du Travail, the great Socialist machine, rose up against the Grand Orient, and latterly all the better feeling of France revolted against it. Notwithstanding the allegations made against French Freemasonry, that body includes all shades of political and religious opinions. For many years there had been no communication between the Grand Lodge of England and the Grand Orient; British Freemasons were prohibited from entering any lodge under the jurisdiction of the latter. A reconciliation appears to have been effected about five years ago when Lord Ampthill, the English Pro Grand Master under the Duke of Connaught (Grand Master), paid a visit to France. It may be remarked that political and religious topics are strictly prohibited in all the other Masonic lodges. Consult *New York Times* on French Masons, 24 Feb., 12 and 14 May 1918).

In Russia Freemasonry first appeared toward the end of the 18th century. Then its activities were mainly of a mystical religious value. The body of its membership was composed of the leading aristocracy of that time. Its rites and influence are vividly set forth in Tolstoy's famous novel, 'War and Peace,' which deals with the War of 1812. It was during the reign of the stern, reactionary Tsar Nicholas I (1825–55) that Masonry began to occupy itself with strictly religious and political questions. After the mutiny in 1825 of the officers of the Guards, known as the Decembrists, in which many prominent Masons took an active part, the lodges of the latter were declared to be political, guilty of political sedition against the Tsar and were but under the ban. Hundreds of Masons were sent to Siberia, most of them dying there in the convict mines. After this Masonry existed in Russia as an «underground» organization, in frank rebellion against the secret police. In the '60's it succumbed, from lack of fresh recruits to keep the movement going. Since that time no evidence has been obtainable that the organization has come to life again anywhere in Russia, although government officials have often announced that lodges had been discovered. In 1913 the party of the Extreme Right in the Duma asserted that Masonry had broken out in the empire again and should be ruthlessly exterminated. Among all the real and imaginary foes of autocracy in Russia none were more feared or more relentlessly suppressed than the so-called «Massonisti.» In Saint Petersburg (Petrograd) a non-political American religious society, known as the «Miyak» or «Lighthouse Society» was almost suppressed because the young men in its gymnasium had begun to wear the Y. M. C. A. symbol of the triangle on their costumes. They were declared to be Masons secretly organized.

Introduction and Early History in America.—It is a well-settled opinion that very early in the settlement of North America Masons of the three classes,—operative, speculative and the irregulars,—met in lodges, without much regard to warrants or charters, and these organizations continued until long after the revival in 1717, especially in the British colonies. Indeed, these assemblies of the craft were

quite apart from regularity and the sanction of Grand Lodges. This was the fact in Philadelphia, in 1730–31; and, again, in New Hampshire soon afterward (the last named apparently having "Old Charges"), though nothing has yet been discovered to connect such meetings with the working of the "historic three degrees" of 18th century notation, and post-Grand Lodge era. This raises the mooted question as to priority in the United States. On 5 June 1730, Daniel Coxe of Burlington, N. J., was appointed Provincial Grand Master of the "provinces of New York, New Jersey and Pennsylvania, in America," by the Duke of Norfolk, Grand Master of the Premier Grand Lodge of England. On 30 April 1733, Lord Viscount Montague, Grand Master, issued a like deputation to Henry Price of Boston, appointing him "Provincial Grand Master of the province of New England, the dominions and territories thereto belonging." Masonic history is obscure as to the part Coxe took in establishing the society, but there is a complete record of the acts of Price. Because of this Massachusetts was acknowledged to be the "mother jurisdiction" for nearly 150 years; while documents now in the archives of the Grand Lodge of Pennsylvania, and "Libre B," of the Historical Society of that Commonwealth, appear to give the primacy to the Keystone State. In support of this contention evidence discovered during the last half of the 19th century goes to show that on 29 Jan. 1731, Coxe visited his Grand Lodge at London, and that a toast was there drunk in his honor, as "Provincial Grand Master of North America"; that from 1732, and for several years, a list of Grand Lodge officers was regularly printed in the *Pennsylvania Gazette,* published in Philadelphia; that, in 1734, Benjamin Franklin being elected Grand Master thereof, wrote to Provincial Grand Master Price in Boston, as to the status of Masonry in Pennsylvania; that in June of that year Franklin met Price in Boston and was *recognized* to the extent of being "further instructed in the Royal Art," by the Provincial Grand Master; and that Grand Master Franklin himself *visited* the Grand Lodge of England, 17 Nov. 1760 A.D.

The rival Grand Lodges in England, together with those of Ireland and Scotland, chartered lodges everywhere, at home and abroad. Patronized by the royal family and nobility of Great Britain the craft acquired greater prestige than history records of any other society, and a system of "military lodges" fostered expansion. The roll of warrants issued during the 18th century and subsequent to 1730 would make a large volume. From these beginnings Grand Lodges were formed in America, composed of lodges of English ("ancients" and "moderns"), Irish, Scottish and "Army" register, increased in number by those holding Provincial Grand Masters' warrants, together with lodges chartered by the earlier American Grand Lodges in the United States and Canada, until regular governing bodies existed in every State, province and Territory. Thus the craft has "followed the flag," wherever unfurled. Unfortunately the early records of many of the lodges existing in the American colonies previous to the Revolution are lost to history. In the royal forces at Louisburg, Crown Point and Lake George were lodges in which many of the king's soldiers (who were Americans) were initiated. Among the many prominent Americans who belonged to the fraternity besides Franklin were Washington, who was made a Mason while in the service of the Crown, under Gen. William Braddock, and became master of a lodge in Alexandria, Va.; Presidents Jefferson, Monroe, Adams, Jackson, Polk, Fillmore, Harrison, Buchanan, Johnson, Garfield and McKinley. Jackson was a Grand Master and McKinley a Knight Templar. Some historians claim Presidents Madison, Taylor and Pierce as Freemasons, but owing to the political disputes of 1826–30 they made no statement as to their connection with the craft. Mr. Taft and Colonel Roosevelt both became Masons after they became President. Other members were Lafayette, Fulton, Montgomery, Sherman, Burr, Rush, Whipple, Paine, Hamilton, Gerry, Steuben, Stark, Livingstone, DeKalb, Warren, Paul Jones, Witherspoon, Revere and Hancock.

Knights Templars and Masonry.—The tradition that the "Baldwin Encampment," which, up to the middle of the 19th century, had been conceded to be the witness that Masonic Knights Templars were descendants of the Knights of the Crusades, is not now accepted. Its earliest accredited document bears date 20 Dec. 1780. The first reference to the Knights Templars as allied to Masonry is contained in the (lodge warrant) minutes of Saint Andrew's Royal Arch Chapter, Boston, Mass., dated 28 Aug. 1769; the earliest in England is that of Phœnix Lodge, No. 257, Portsmouth, 21 Oct. 1778. Kilwinning Lodge of Scotland, on 8 Oct. 1779, by its master, Earl Eglinton, warranted the "High Knights Templars of Ireland," at Dublin. The Grand Lodge at York sanctioned the degree of "Knight Templar" in 1780. Similar references,—at dates between the Saint Andrew's Chapter's record and the institution of the Grand Encampment, Knights Templars, U. S. A., 11 June 1816—may be found scattered throughout the fugitive minutes of lodges and chapters wherever the British army had been stationed. Whence, then, came the modern "Order of the Temple"? An answer, founded upon historical facts, has never been made. Two theories have been advanced: (*a*) It is within the range of possibility that a connection existed between the chivalric order of Knights Templars and the fraternity of Operative Masons of mediæval times, because bodies of skilled workmen erected Templar strongholds in the Holy Land, and built their preceptories, priories and round churches in Europe. The famous Temple Church, London, is an example. What, then, was more natural than that the Knights Templars in the 14th century, proscribed, persecuted and despoiled of all things, should seek their perpetuation among the affiliated bodies of mechanics of whose universality and antiquity they had abundant evidence? (*b*) On the other hand no historical doubt exists that every Freemason living since the revival of 1717 can trace his pedigree only to Great Britain. No other association, guild or otherwise ever grew into a society of Freemasons, nor was any connection with the building trades of the Continent ever claimed by the first Freemasons of Europe. The craft there

was a direct importation from England, and in its infancy and for many years was confined to the upper classes, without the least admixture of the artisan. This was true in Germany, where the French language, that of the court and diplomacy, was the one used in keeping minutes, and the early lodges bore French names. In 1740, however, in contradistinction to English, a Scottish Masonry arose,—reputed to hail from Scotland, but having no real connection with the regular society; and from this source have emanated most of the traditions relative to the alleged transmission of the chivalric degrees from the Knights Templars, of whom Jacques de Molai,—executed 11 March 1314 A.D.,—was the last Grand Master. In order to prove the Templar succession, and the legend of Scottish Masonry, it becomes necessary to account for an interregnum between the year 1309, when Walter de Clifton, Preceptor of the Scottish Knights Templars, admitted the dispersion of his brethren, and the date when modern Templary appears of record, during the 18th century at Boston, manifestly a historical impossibility. Nevertheless, "history fails to record much that actually occurs; much that subsequent ages would gladly know." Notwithstanding, as late as 1854 an authorized edition of "The Templars' Chart," by Jeremy L. Cross, published in New York, gave a succession of Grand Masters from Jacques de Molai—based on a clumsy forgery of the Swedish Templars,—to the year 1838 A.D. Like many another ingenious theory framed to connect the "old" with the "new" dispensations, tradition may be true, but it is unsupported by documentary evidence.

The Secret Monitor.—In Freemasonry there are, in addition to what is known as Craft Masonry, which in England and Wales and the Overseas Empire is under the jurisdiction of the Grand Lodge of England, of which the Duke of Connaught is Grand Master, certain extraneous Masonic associations to which only regularly initiated Freemasons can belong, but which are not recognized by the Grand Lodge. For example, in England Mark Masonry is not recognized by the Grand Lodge of England, although the Duke is also the Grand Master of the Mark Master Masons. Royal Arch Masonry is, however, officially recognized by the Grand Lodge of England. The reverse is the case under the Grand Lodge of Scotland, which recognizes the Mark but not the Royal Arch Masonry, while in Ireland both are recognized by the Grand Lodge of Ireland. One of the associations outside of "official" Freemasonry is the "Order of the Secret Monitor." It is claimed that the "Brotherhood of David and Jonathan," from which this Order developed, is as old as Freemasonry itself. The earliest existing records of an organized system of the Brotherhood are found in Holland, where it is said to have been founded in 1773. It was carried by Dutch emigrants to America, where it spread rapidly. In 1845 the Order was established in Malta, in the following year in the West Indies, in 1848 in Jerusalem and in 1865 it became known to English Freemasons. It was not till 1887 that a definite attempt was made to organize the Order in England by the Bon Accord Lodge of Mark Master Masons. A Grand Council was formed and four conclaves (or lodges) came into being. Seven more conclaves were formed in 1888, and there are now about 45 under the jurisdiction of the Grand Conclave of the United Kingdom. Some of these conclaves are held in India, Burma, South Africa and other parts of the empire.

Masonic Unity.—At the outbreak of the war in 1914 there were six "foreign" lodges in London under the jurisdiction of the Grand Lodge of England. Two of these—La France and L'Entente Cordiale have only Frenchmen as members; two—Deutschland and Der Pilger were German lodges; one—Loggia Italia—is composed of Italians; and one—America Lodge—is limited to Freemasons born in the United States. Each year a united festival of these lodges was held. For some years prominent Masons in Great Britain expressed a desire that there should be an extension of this international ideal. In March 1913 Lord Amphill said at Birmingham: "I may be a dreamer, but I consider that there is great scope in Freemasonry for improving the relationship among nations." A society was formed in June to advance simple Masonic truths and principles; to promote the practice of the ritual in English, French, German and Italian; the study of English, American and European Continental Masonic history, so that members might become more familiarized with the original aims of Freemasonry; and the arrangement of international tours. In short, the object was to weld together into one associated body the Freemasons of the world. The occurrence of the war will undoubtedly retard that movement for many years. It is a remarkable fact that none of the rulers or statesmen connected with the outbreak of the war was a Freemason. Among the military there were many, of whom the principal were General Joffre and Lord Kitchener. In February 1919 Grand Master W. S. Farmer of the Grand Lodge of the State of New York issued an edict abolishing the use of foreign languages in ritual and proceedings in the lodges of the State from 1 July 1919. This order affected 48 lodges in which languages other than English were spoken.

Organization and Degrees.—Craft Masonry was universally organized on the basis that within itself was conserved all the powers of the entire institution. A Grand Lodge once duly established must *sui generis* be sovereign in its jurisdiction, the bounds of which soon became restricted to a state, province or other recognized political division. The territorial limits of a Grand Lodge being sacred from invasion, and this principle enforced, Masonry has escaped the successful competition of alleged rival rites purporting to be the craft itself, and also has been secure in its privileges from any and all plans to confederate these bodies into one centralized government,—a guaranty of the perpetuation of the democracy inherent therein. But the symbolism of "Solomon's Temple" as the most glorious edifice of ancient times, probably introduced by Drs. Anderson and Desaguliers (whether from the lost manuscripts, or otherwise, is not essential), required a more ornate adornment and furniture than a foundation and the bare superstructure upon which Operative Masons had wrought,—hence, naturally, suggested degrees above the original three of the Revival, *et seq.* For more than a

century men toiled to perfect the society,— often building better than they knew,— until the three Rites became settled as at present established. The best minds contributed toward this end. As in the Old World, so in the New, the institution had attracted to itself men of high character and standing in the governments thereof, and men of letters contributed their full quota to develop the fraternity, which was expected to endure, as these promoters believe it had already existed, for ages. France, in particular, was prolific in the "fabrication" of degrees and rites, the great volume of which survive only in the musty tomes of 18th century literature. As before inferred, the so-called Scottish Masonry became the forerunner of a rite that, perfected by scholarly Masons, ultimately became the Ancient and Accepted Scottish Rite. This title is now applied to a system which was first definitely organized at Charleston, S. C., 31 May 1801. The rite in several of its degrees can boast of a very respectable antiquity, having descended from a "Council of Emperors of the East and the West," at Paris in 1758. It is also based on the three craft degrees, and its postulants must be Master Masons in good standing, in whatever other regular rite they may hold membership. The original Supreme Council in America passed through an experience similar to that of the premier Grand Lodge of England before its authority as "Mother of the Rite" was fully established in the Masonic world; but peace came finally, and two recognized bodies exist in the United States: the primate, as the "Southern Jurisdiction," and the present "Northern Jurisdiction," established by a concordat, signed at Boston, Mass., by several rival Supreme Councils, 17 May 1867. This rite was introduced into England in 1845; and other Supreme Councils of this obedience exist in Scotland, Ireland, Canada, Egypt and colonies of Great Britain; in France and dependencies, and in other countries of Europe, excepting Russia; in South and Central America; and in the West Indies. As before stated, the Masonic government is complex, no two rites — nor even Grand jurisdictions of the same rite,— being alike, owing to variances in the sequence of their degrees. The English and American are substantially in unison as to chronological order: Craft, Capitular, Cryptic and Chivalric degrees. In the American Rite its degrees follow this notation exactly, being the Royal Arch Chapter, Council and Templar systems, respectively. England, Scotland and Ireland, working the English Rite, are not altogether in accord,— additional degrees and orders being incorporated,— but eventually all arrive at practical universality, nevertheless. The A.·.A.·.S.·.R is divided into grades or degrees: symbolic (the three Craft degrees, which are not conferred, however, in jurisdictions of the English and American Rites), Ineffable, Historical, Philosophical, Historical and Philosophical, Chivalric, Official and Executive, — conferred in lodges, councils, chapters, consistories and supreme councils.

The Ancient Arabic Order of Nobles of the Mystic Shrine (q.v.) has fostered and developed the social side of Freemasonry, in its "higher degrees," principally in America.

The Order of the Eastern Star is not a Masonic organization, but a secret sisterhood to which only Freemasons and certain female relatives can belong.

It is estimated that there are considerably over 2,000,000 Freemasons in the world, of which by far the majority are in the United States.

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MASONRY (Fraternity). See Masonic Fraternity.

MASONRY AND BUILDING. Masonry, from the French, *maçonnerie,* meaning stone or brick work, derived from the Latin, *maceria,* a wall, is the operation of laying up natural or artificial stones, generally held together or made a single mass by mortar, plaster or earth. It is the most important part of stone and brick structures, and a mason frequently becomes the general contractor for a whole building of this class. The different trades required in mason building begin with building movers or the workmen who raze or demolish old buildings; then come the excavating, drainage, grading, paving, piling, foundations, rubble, cut stone, including cut moldings, modeling and stonecarving, brick masonry, concrete work, fireproofing, terra-cotta work. After this heavier construction follows lighter mason work: plastering on metal or wood lathing, and stucco. The ideal of good masonry is a structure of natural or artificial stone that shall stand as the permanent skeleton of the building,

firm and enduring; its great first cost shall mean no further care or expense.

History.— The Egyptian stonework that has survived the centuries is generally of enormous blocks jointed with astonishing accuracy, so as not to mar the effect of the bas-reliefs which covered several courses. Assyrian walls were laid up with bricks forming the exterior surface and the interior was filled with rubble and earth. The *Opus reticulatum* and *opus incertum* were later Roman forms where small blocks of tufa or triangular brick were used for the exterior surface and the interior was filled with concrete. The characteristic of Greek masonry was to use local stone, accurately cut and jointed if the stone would bear it; otherwise covered with stucco. From the lintel or beam architecture of the Greeks to the arch construction of the Romans was an advance in the possibility of size of construction, but a change from a system of making the constructive forms visible and decorative to a custom of covering rough walls with a decorative shell not expressing the supporting masonry work behind. This method of building gave the Romans an opportunity to make their enormous structures at a low cost, because unskilled labor could be employed to much better advantage, needing only a small number of foremen. Romanesque masonry was very crude and the thrusts of the arches were taken care of by a mass of abutments which were practically monolithic. In Byzantine work the arches and domes were made from small blocks of stone and the thrusts were studied with much greater care. In Gothic work the arch became "alive," carrying the weights and thrusts of the upper parts of the building on slender shafts, and through flying buttresses with the utmost skill to the outer walls and buttresses. Modern work has come to partake of the character of the ancient Roman construction, that is, a veneer on interior supporting masonry of a different character. In our time, however, instead of the huge concrete monolithic buildings, an iron skeleton is used, and a thin shell often not more than four inches in thickness covers a frame work of steel beams that in a high building is little more than an iron bridge on end. The old Roman flat arch construction of thin bricks or tiles held together by strong cement forming domes not over six inches thick and easily spanning 15 feet or 20 feet is also used.

Men and Material.— The workmen employed on masonry are stonecutters, who generally work in stone yards away from the building, except for such trimming as may be necessary in setting the stone; stonemasons who work on the building, setting the stone; bricklayers who work on platforms continually raising and placing the brick accurately; and laborers for delivering the stone, mortar, etc., and for mixing mortar and concrete. The materials used are stone, cement blocks, brick, terra-cotta, broken stone, cinders; and adhesive materials: limes and cements, which are used with sand to make a mortar for binding the materials together. In very crude construction, mud and clay are used for a binding material. Foundation walls may be of stone laid dry; of concrete; of stone laid in Portland cement mortar or half-cement mortar, the latter consisting of sand, cement, lime, with cement and lime in equal proportions. In case of the soil under the building not being sufficiently firm, it is necessary either to drive wooden piles or to spread the foundation so far that the pressure per square foot on the soil will not be sufficient to cause the building to settle. In Chicago the footings are very large, of steel beams and concrete, making what is practically a raft so that the building really floats on a soft soil. Where the foundations are under water, as under a bridge pier, it i necessary to adopt special methods, generally sinking caissons so that workmen may go down and work under water.

The outer row of stones of a wall are termed the *facing;* those within the *filling;* those at the rear the *backing.* A horizontal laying of either stone or bricks is a *course;* a sloped surface of a well is a *batter;* a protecting often projecting course on top is a *coping.* A *bond* is a stone going through two or more courses to bind them together; a *quoin* is a squared stone at a corner; a *stretcher* is greatest in horizontal length, a *header* shortest, the latter being a bond. A *cramp* is a bar of iron or steel let into a wall to brace it. *Ashlar* are squared stone; *rubble* irregularly shaped stone. A *corbel* is a stone projecting as a balance-weight; a *sill,* a broad stone at the base of an opening; a *template,* a large stout stone for supporting the end of a girder or beam.

Ashlar Facing.— The stonework of the outer face of a wall when it is cut and differs in character from the back of the wall is called *ashlar.* The coursing of ashlar is done in different ways. The simplest form is when it is laid out in continued courses. In this case it is caller "regular coursed ashlar." Ashlar is also laid without long horizontal joints. In this case it is called "broken ashlar." This is generally used when stone cannot be easily obtained of equal heights. It takes longer to lay this up, which makes it cost more than the regular courses, but makes a very attractive looking wall, having more freedom and texture. It is customary to cut the stone at the stone yard certain heights; for example, two, four, six and eight inches, so that they can be laid up without cutting any joint except the end joint, at the building. From three to six different heights are generally used, the larger number giving more variety than when the smaller number of sizes is used.

Coursed random ashlar has horizontal joints one-half to two feet apart, continuous. Between these joints the stone is laid up irregularly. The other stone on the walls of a building are called trimmings, which include the molded work, the window sills, jambs and the quoins, which are the cornerstones of the building. The quoins and jamb stones, if of the same material, may be included with the rest of the ashlar. The part of the wall back of the ashlar (called the backing) is of cheaper stone or brick. It is never under eight inches thick when of brick, and if of stone the backing is thicker. This should be built and bonded in at the same time as the ashlar in order to make a solid wall. If the stones are not high, the thickness of the ashlar should vary so that the backing can bond in and it is generally specified that the ashlar should include one through bond stone in every 10 square feet of wall. If

the facing is thin (two inches to four inches), the pieces are clamped back into the backing by iron clamps. Random rubble is where untrimmed stones are used, and selected to fit as well as possible.

In public work and important buildings, every stone should be shown on the drawings, except when random ashlar is employed. In this case the arrangement of the stone is made by the foreman on the building, to follow a sample piece of ashlar set up and approved by the architect. Ashlar is usually from four inches to eight inches thick. In figuring the quantity an average of six inches in thickness is generally taken. The heights vary from 10 inches to 14 inches. For exterior work the ashlar should not be under four inches thick. The ashlar may be laid with V joints, or with rustication. In the latter case the face is generally rock-face or pointed and a draftline an inch wide is carried around the edge of the stone.

Bond stones are stones that go into the wall to hold the wall together. If there are many small stones these should be frequent. In laying out ashlar the bond should be arranged to give effective stone jointing. Sometimes the Flemish bond arrangement is used as in brickwork. Bond stones the full size of a pier are frequently used for caps and also placed at intervals through the pier.

Brickwork.— Bricks are laid so as to distribute the load and tie the different portions of the wall together. Stretchers are brick which are laid showing their long side. Headers show the end of the bricks. Common bond is to lay the brick with stretchers for five courses and then lay headers for the sixth course. Face brick bond is as a rule laid of stretchers and bonded either by clipping the corners of the bricks, which tie the face of the wall to the backing, or with metal wall ties, which are made of wire, crimped metal or of tin fastened to steel wire. Flemish bond is the bond which is most frequently used to give an interesting wall surface, more pleasing than what is obtained with common bond. It is laid up with alternate headers and stretchers. The small piece inserted at the corners is called a closer. English bond consists of courses of headers and stretchers alternating. A variety of this, called English cross bond, has the alternate courses of stretchers arranged with the joints below the middle of the bricks above, making a figure resembling a cross. Sometimes every fifth course of brick is laid Flemish bond with the others straight bond. Every fifth course may be set in or back an inch, forming rusticated work. When walls have hollow or "vaulted" spaces not over two inches wide in the centre the bond is made by bricks laid across the space and cut in diagonally, or by the use of metal ties every four to eight courses. In arches, the face of the arch is made with the same bond as that shown on the wall. Common arches are made with successive rings or rowlocks, of headers.

Bricks.— Despite the great increase of concrete and steel construction, brick seems to be used as much as ever, as they are not affected by the weather, fire or city atmosphere. which affects the softer building stones seriously. They are cheaper than stone and can be used with cut stone or terra-cotta trimmings. Hard burned bricks are used for piers, though not so good for this purpose as stone work, and in very dry soils are sometimes used for foundation walls. If there is any dampness of the soil, the outside of brick foundation walls is sometimes painted with water-proof paint. Bricks are made from sand and clay, the clay in different localities making bricks of different characteristics. A sandy clay is most desirable. For the better kinds of brick, clay is often chosen from different places and combined with the greatest care. (See BRICK-MAKING MACHINERY). Terra-cotta and pottery are burned in kilns which are arranged to let in heat half way up the kiln so that it will be drawn down on to the pile of terra-cotta and through the floor of the kiln into the chimney. This is said to give a more even heat. If there is iron in the clay the color of the brick will be red; the ordinary white bricks are generally due to lime. The proportion of iron makes the red of various shades, according to the amount. Lime and iron make a cream-colored brick. Brown bricks are due to the presence of magnesia; and magnesia and iron make a yellow brick. Different clays give varying color effects, and the mixture of clays with mortar colors, or painting the exposed surfaces, gives desired effects. Bricks should not absorb more than from one-twentieth to one-tenth of their weight of water. This is a test that can be easily applied. Soft bricks may absorb as much as a quarter of their weight. Bricks should ring when struck, as cracked or soft bricks will give a dull sound. They should not have any cracks or large lumps or foreign substance, such as lime or coarse gravel. They should run all the same dimensions with true surfaces, though for rustic work rough bricks are often desired. The approximate size of a brick is 2 inches × 4 inches × 8 inches. In the Eastern States 7¾ inches × 3¾ inches × 2¼ inches; but in the Western States the dimensions are slightly larger. In every case where brick work has to be figured for cutting stone trimmings, the brick should be laid up and measured. Pressed brick are generally 8⅛ inches × 4⅛ inches × 2⅛ inches in size. Roman brick is 12 inches long and 1½ inches thick. Norman brick is 12 inches long and 2 inches thick. Bricks weigh four or five pounds apiece.

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See QUARRYING; STONE-CUTTING AND DRESSING.

MASOOLA, mą-soo'lą, a boat common on the east coast of India, adapted to be beached on the surf-beaten shore. The planks are sewed together with coir, over wads of the same material, which press upon the seams. The boats are 30 to 35 feet long, 10 to 11 feet beam, 7 to 8 feet deep, and are rowed by 12 men, oars double banked, and a steersman with an oar at the stern.

MASORA, măs'ō-rą, or **MASSORAH,** MASSORETH, a Hebrew word signifying "tradition," the name of a collection of notes referring to the Hebrew text of the Old Testament, and written in Chaldee chiefly on the margin of Hebrew manuscript. These notes

are various in their character, critical, grammatical and explanatory. Since in early Hebrew writing no vowel signs appeared, great confusion arose in time from the many modes of reading and supplying vowels to the consonants. The Masora set a fixed reading to each word and thus put an end to the multiplicity of readings. At what time the accumulation of these notes was commenced cannot be ascertained. According to some Jewish writers the notes are in some cases as old as the time of Moses; according to others they were begun in the time of Ezra. It is more likely that they are the result not of one period but of many centuries of compilation and emendation. A useful edition of the Masora is the translation of Dr. Ginsburg (3 vols., London 1880–87). See JUDAISM — *The Massorah.* Consult Cornely, 'Introductio in V. T. Libros Sacros' (Vol. I, Paris 1894); Ginsburg, C. T., 'Introduction to the Hebrew Bible' (London 1899); Driver, S. R., 'Notes on Hebrew Text of the Books of Samuel, with Introduction to Hebrew Palæography' (2d ed., Oxford 1913); Harris, 'Rise and Development of the Massorah' (in *Jewish Quarterly Review,* Vol. I, London 1889).

MASPERO, Sir Gaston Camille Charles, gäs-tôn kä-mēl shärl mäs-pĕ-rō, French Egyptologist: b. Paris, 23 June 1846; d. 30 June 1916. He studied in the Lycée Louis-le-Grand, 1853–65, and before entering the École Normale in 1865 had already made considerable progress in the study of Egyptology. He remained in the latter college two years and attracted the attention of Mariette, the distinguished Egyptologist. In 1867 he published in the *Revue Archéologique* an Egyptian text and translation under the title 'Stèle du Songe,' and in the same year appeared separately his 'Mémoire sur la grande Inscription d'Abydos et la Jeunesse de Sésostris.' On leaving the École Normale he went to South America to carry out researches in the Quichua language. Further memoirs on ancient Egypt extended his reputation and secured his appointment in 1869 as professor of the Egyptian language and archæology at the École des Hautes Etudes. In 1871 he issued an important essay, 'Des Formes de la conjugaison en Egyptien ancien, en démotique et en copte'; and in 1873 'De Carchemis Oppidi Situ et Historia antiquissima' and 'Du genre epistolaire chez les anciens Egyptiens.' In 1874 he succeeded Rougé as professor of Egyptian philology and archæology at the Collège de France. Sent to Egypt in 1880 as head of a government archæological mission, he succeeded Mariette in the following year in the directorship of excavations and antiquities. He founded and directed an archæological institute at Cairo, had charge of the museum at Bulak, now in Gizeh, carried out many excavations, with important results, and in 1886 returned to France to resume his duties at the college. In 1899 he again went to Egypt as director of excavations and antiquities. In 1914 he left Egypt and became permanent secretary of the Academy of Inscriptions and Belles-Lettres. Maspero's great work is his 'Histoire ancienne des Peuples de l'Orient' (1875), which has been republished in an enlarged and revised form (1894–99). The three volumes of the later edition have been translated into English under the titles 'The Dawn of Civilization' (1894), 'The Struggle of the Nations' (1896) and 'The Passing of the Empires' (1900). His other works comprise the following: 'Contes populaires de l'Egypte ancienne' (1883), translated by him; 'Etudes Egyptiennes' (1886-91); 'Archéologie Egyptienne' (1887; Eng. trans. 'Egyptian Archæology,' 1888); 'Lectures historiques' (1890; Eng. trans., 'Life in Ancient Egypt and Assyria,' 1892); 'Etudes de Mythologie et d'Archéologie Egyptiennes' (1893), invaluable to the student of the religion of ancient Egypt; besides contributions to the 'Mémoires' of the French Archæological Mission at Cairo; 'Les momies royales de Dêir-el-Bahari' (1889); 'Causeries d'Egypte' (1907; Eng. trans., as 'New Light on Ancient Egypt,' 1909); 'Egypt, Ancient Sites and Modern Scenes' (1911); 'Art in Egypt' (1912), and text and translations of the inscriptions upon the pyramids of the fifth and sixth dynasties in *Recueil de travaux relatifs à la philologie et parchéologie égyptiennes et assyriennes* (Vols. I–XIV), etc. In 1879 Maspero was made a knight of the Legion of Honor, and in 1895 commander. In 1883 he became a member of the Académie des Inscriptions, and in 1887 an honorary Fellow of Queen's College, Oxford, and an honorary D.C.L. of that university. In 1909 he was made knight commander of Saints Michael and George. See EGYPTOLOGY.

MASQUERADE, măs-kē-rād', a popular amusement, in which persons of both sexes mask or disguise themsevles and engage in dancing or festivities. Masquerades date from a very early period in which they were connected with religious ceremonials and observances. We find traces of the masque in the Bacchanalia of Greece, the Saturnalia of Rome and in the Purim of the Hebrews. In the Middle Ages they were at times held in the churches, for instance the ceremony of the boy bishop, the feast of fools, etc. The clergy succeeded in putting a stop to these relics of paganism in connection with Christian worship in the 16th century. Masquerades of the modern purely secular type are said to have been the invention of Granacci, an Italian, who lived in the beginning of the 16th century. See CARNIVAL; FESTIVAL.

MASQUERAY, Emmanuel Louis, American architect: b. Dieppe, France, 10 Sept. 1861; d. Saint Paul, Minn., 26 May 1917. He was educated at Rouen and Paris. Having decided to become an architect he studied at the École des Beaux Arts, Paris, and in 1879 was awarded the Deschaumes prize by the Institute of France. He also received the Chandesaigues prize in 1883. While in Paris he was also an attaché of the Commission des Monuments Historiques. Mr. Masqueray came to New York in 1887, and was at first connected with the office of Carrere and Hastings and later in the office of William M. Hunt. He opened an office here in 1893 and founded the Atelier Masqueray for the study of architecture according to French methods. This was the first wholly independent atelier opened in this country. His reputation became international in 1901 when the commissioner of architects of the Saint Louis Exposition selected him to be chief of design or consulting architect. This monumental undertaking included the Trans-

portation Palace, the Agricultural, Horticultural, Fisheries and Forestry buildings, the Cascades, the Colonnade of States, pavilions, the Louisiana Purchase monument, 12 bridges, music stands and all the decorative architecture in the grounds. Mr. Masqueray was the architect of the famous cathedral of Saint Paul in Saint Paul, Minn., and the pro-cathedral of the Immaculate Conception in Minneapolis, Minn. He was a charter member of the Society of Beaux Arts Architects and the Architectural League of New York, the New York Chapter of the American Institute of Architects, as well as the national organization.

MASQUES. The old masques, fashionable in England in the 17th century, were in reality the kind of private theatricals that then generally prevailed at the courts of Europe. Their name is understood to have originated from the use of the head masque, representing either romantic, historical or allegorical types on occasions of festivity or solemnity. The first of these masques (or ballets, as they were called in Italy and France) that we find recorded was that given by Bergonzio di Botta, at Tortona, to celebrate the marriage of the Duke of Milan in 1489. It was the talk of all the élite of the Western World. Originally a parade or festival, a form of dramatic masque quickly developed in England under the wits of men as deft as Ben Jonson and Fletcher, aided and abetted by the master-designer, Inigo Jones (q.v.), reaching a height of tawdry theatrical beauty that died out almost as quickly as it had flamed. At Versailles and other courts the masque or ballet survived for over a century longer. The masque of to-day is philosophical in character. It is the drama of personified ideas. It is akin to allegory. Its dramatic purpose is the presentation of universal truths; and in this indirect way to bring their lessons home to the mind and heart alike. The pageant and masque are distinctly antithetical in character. The one is essentially concrete, the other is essentially abstract. The one depends on realism to tell its story, the other depends on symbolism, though either may make use of the elements of the other in subordination. Mr. Percy Mackaye's 'Masque of St. Louis,' performed in that city in 1914, was perhaps the soundest achievement of the American poet in this new form which has yet to find its authentic masters. During the Shakespearean tercentenary celebrations of 1916 many commemorative masques were written and performed. For these and sundry lists of "Masques and Festivals" lately held in the United States consult the bulletins of the American Pageant Association. See FESTIVAL; PAGEANT. The standard authorities on the English masques are Evans, H. A., 'English Masques' (London 1898); Reyher, Paul, 'Les Masques Anglais: étude sur les ballets et, la vie de cour en Angleterre, 1512-1640' (Paris 1909); Brotenak, Rudolf, 'Die Englischen Maskenspiele' (Vienna 1902).

MASS, *in physics,* the quantity of matter in a body. The mass of a body is the same wherever the body may be in the universe. Two bodies have equal masses if the gravitating forces with which another body acts upon them are exactly equal at equal distances. (See GRAVITATION). Hence two bodies have equal masses if their weights are the same at the same place on the earth; so that if the metallic "weight" used by a grocer is carried from place to place, the quantities of sugar and tea balanced by it in a good pair of scales will always be the same, for the mass of tea or sugar is in every case equal to the mass of the metalic "weight." It is to be clearly understood that as the force of gravity is different at different places on the earth, the weight of any body is different at different places. To distinguish between the mass (or quantity of matter) and the weight (or force which tends to move it downward) of a body is very important in beginning the study of physics.

MASS, The. According to the teaching of the Catholic Church, the Eucharist is the Sacrament which contains the body and blood, soul and divinity, of Jesus Christ under the appearances of bread and wine. At the Last Supper (see LORD'S SUPPER), the night before He died, Christ, in the presence of the 12 apostles, instituted the Eucharist (q.v.) by taking bread, giving thanks, blessing the bread, breaking it, and giving it to the apostles, saying, "Take ye and eat. This is my body," and then by taking the cup of wine, giving thanks, blessing the wine, and giving it to them, saying, "Drink ye all of this. This is my blood which shall be shed for the remission of sins. Do this for a commemoration of me." The Church teaches that, when Christ said "This is my body," the substance of the bread was, by His almighty power, changed into the substance of His body, and that, when He said "This is my blood," the substance of the wine was similarly changed into the substance of His blood, while the appearances of bread and wine remained. The Church further teaches that the change of bread and wine into the body and blood of Christ, called Transubstantiation (q.v.), continues to be made by Jesus through the ministry of His priests, to whom through the apostles and their successors, He gave this miraculous power when He said, "Do this for a commemoration of me." The priests exercise this power of Transubstantiation through the words of consecration in the Mass. What, then, is the Mass? The Mass is the solemn memory, with a narrative, of Christ's passion and death. It is the perpetual sacrifice of the New Covenant. In the catechism it is described as the unbloody sacrifice of the body and blood of Christ. It is, specifically, a sacrifice of adoration, thanksgiving, propitiation, and impetration. As, in the offering of this sacrifice, certain words and actions in fixed form are used, the Mass may be defined as the aggregate of prayers and ceremonies which constitute the service of the Eucharist in the Latin, that is, the Roman and Gallican, rites.

This service was known at first by many names: *Εὐχαριστία*, gratiarum actio, thanksgiving; *Λειτουργία*, liturgy, rite; *προσφορά*, oblatio, offering; *κλάσις ἄρτου*, fractio panis, breaking of bread; *κυριακὸν δεῖπνον*, cœna Domini, the Lord's supper; *κοινωνία*, communio, communion; *σύναξις, συνέλευσις*, meeting; solemnia; dominica solemnia; dominica passio; spirituale ac cœleste sacramentum; Dominicum; passio; sacrificium. *Λειτουργία* still survives in the Eastern Church, and "holy liturgy" corresponds exactly to the word Mass. This latter

term has become the recognized and almost exclusive technical name for the liturgy of the West. Its derivation is even yet not quite certain; but it is generally said to be a late Latin verbal noun for *missio* (=*dimissio*), from the verb *mittere,* to send, send away. Primarily, *missa* was used in the sense of "dismissal" with reference to the concluding part of the service, and then, by a gradual process well known to linguists as well as to students of liturgy, it was extended to the whole rite. The first time we know for certain that it was employed in its present sense was in the 4th century, about 385 or 386, in a letter of Saint Ambrose to his sister, in which occurs the statement, *missam facere cœpi* (=I begin to say Mass). A 2d century instance of the use of the word *missa* in this sense is of doubtful authenticity. From the 4th century onward it becomes more and more frequent, until in the 'Sacramentarium Leonianum' (Leonine Sacramentary), of the 5th or 6th century, it is understood throughout (*Item alia=Item alia missa*), and in the 'Liber Sacramentorum Romanæ Ecclesiæ,' usually known as "The Gelasian Sacramentary," of the 6th or 7th century, it is constantly expressed. Thereafter, while Eucharist remains the normal name for the sacrament, *Missa,* or one of its derivatives in other languages like Mass in English or Messe in French, has been the regular title given to the Eucharistic sacrifice in the Roman and Gallican rites.

So much for the word, which is clearly much later than what it denotes. The history of the Mass itself has its origin in the New Testament in the four accounts of the Last Supper found in Matthew xxvi, 26–28; Mark xiv, 22–24; Luke xxii, 19–20; and Paul, 1 Cor. xi, 23–26. What Christ then did is the foundation of the Mass. It is because He told the apostles to do, in memory of Him, what He himself on that occasion had done, that the liturgy of the Mass came into being and has continued through the ages. That liturgy, fluid and variable in detail, but uniform in outline and in many formulas, always the same in essentials, and from constant repetition tending ever to become fixed, is traceable with more or less certainty through the 1st century in different parts of the New Testament, in the 'Didache' or "Teaching of the Twelve Apostles" (c. 80–100), in the 'First Epistle of Saint Clement of Rome to the Corinthians' (c. 90–100), in the 'Epistle of Barnabas' (c. 96–98), and in the letters of Saint Ignatius, bishop of Antioch (d. 107). In the 2d century there is very probably an interesting allusion to the Mass from the outside, in a letter written by the pagan, Pliny the Younger (C. Plinius Cæcilius), governor of Bithynia, to the Emperor Trajan about 111–113. The eucharistic service, mentioned by Saint Polycarp, bishop of Smyrna (martyred c. 155), by Athenagoras of Athens (c. 177), and by Theophilus, bishop of Antioch (c. 180), is set out in considerable descriptive detail by Saint Justin Martyr (put to death, c. 165) in his 'First Apology' addressed to Antoninus Pius (138–161), and is also treated of by Saint Irenæus, bishop of Lyons (d. c. 202). In the 3d century we already see traces of those different practices in different countries which led to the different liturgies. For the rite followed in Alexandria and Egypt, we have as spokesmen Clement of Alexandria (d. c. 215), Origen (d. 251), and Dionysius of Alexandria (d. 264); for that of Antioch and Syria we have the fragmentary outline given in the second book of the 'Apostolic Constitutions' (which, however, was not written down until the 5th century as the *Διαταγαὶ τῶν ἁγίων ἀποστόλων*), as well as the complete text of a liturgy in the eighth book of the same work; for Rome and the West we have vague allusions in the writings of Hippolytus (d. 235) and Novatian (c. 250); and for the African Church or Church of Carthage we have Tertullian (d. c. 220) and Saint Cyprian, bishop of Carthage (d. 258). The liturgy given in the eighth book of the 'Apostolic Constitutions,' as well as being an early form of the rite of Antioch, is also possibly an example of an early type of the rite of the whole Church. When we reach the 4th century we have much fuller liturgical information, at least for the East, not only in the writings of Saint Athanasius (d. 373), Saint Basil (d. 379), Saint Cyril of Jerusalem (d. 386), and Saint John Chrysostom (d. 407), but also in the *εὐχολόγια*, or service books, which from about the end of this period began to be compiled for Church use. From this time, too, we have the specifically different rites which were already foreshadowed in the 3d century. It is generally accepted that the fairly uniform type of liturgy previously used everywhere developed into four great parent-rites, from which all others now in use in Christendom are derived. These four are the liturgies of Antioch, Alexandria, Gaul, and Rome.

I. The rite of Antioch, found pure in the Greek 'Apostolic Constitutions,' was modified at Jerusalem into the Liturgy of Saint James, which itself took the place of the older liturgy at Antioch, and was used throughout the whole patriarchate, embracing all western Syria. This modified liturgy is found in (1) the Greek Saint James, now used only once a year at Zacynthus on 23 October, the feast of that saint, and at Jerusalem on 31 December; (2) the Saint James in Syriac, used by the Syrian Jacobites and Uniates; and (3) the Maronite rite, used in Syriac and also in Karshuni, that is, Arabic written in Syrian characters. The second rite derived from the primitive one of Antioch is the East-Syrian or Chaldean, which is found in two forms, (1) that used, in Syriac, by Nestorians and Chaldean Uniates, and (2) the Malabar rite, which is used, also in Syriac, by Malabar Uniates. The third derivative of Antioch is the Byzantine rite, used in Greek, Arabic, Old Slavonic, Rumanian, and many other languages, by all the Orthodox and by Melchites and other Byzantine Uniates. Next to the Roman Mass, this is the most widespread Christian liturgy. The fourth and last rite derived from Antioch is the Armenian, which is used, in classical Armenian, by Armenians, whether Gregorian (i.e., schismatical) or Uniate. II. The second eastern rite, the Alexandrian, gives us (1) the Greek Liturgy of Saint Mark, which is now no longer used; (2) the Saint Mark in Coptic, used by the Copts, both Monophysite and Uniate; and (3) the Ethiopic liturgy, used by the Monophysite Church of Abyssinia. The two great western parent liturgies are the Gallican and the Roman. III. The Gallican rite, in Latin, was used in

North Italy, Gaul, Germany, Spain, Britain, and Ireland. It was imported about the 4th century from the East, probably from Antioch. From about the 8th century it began to be gradually supplanted by the Roman rite, which became itself considerably Gallicanized in the process. By the 10th or 11th century the Gallican had entirely given way to the Roman rite, except in one or two places. It still survives under the title Ambrosian at Milan, in Italy, and under the title Mozarabic at Toledo, in Spain. In each case it is greatly Romanized, particularly so at Milan. IV. Finally, we have the liturgy of Rome. The original pure Roman rite is now no longer used, nor is the African rite, which belonged to the same family and had many features in common with the present Roman Mass, not the least being that its language was Latin even at a time when Greek was still employed at Rome and elsewhere. The present Roman rite, by far the most widespread of all, is used, in Latin, by nearly the whole Roman patriarchate. It occurs, however, in a Slav dialect in parts of Dalmatia and occasionally in Greek at Rome. In parts of southern Italy, Sicily, and Corsica, although they belong to the Roman patriarchate, the Byzantine rite is used. There are various mediæval modifications of the Roman rite peculiar to the religious orders of the Dominicans, Carthusians, and Carmelites. There were also modifications adopted in certain dioceses, and a few of them, Lyons for example, still keep these local forms; but in most cases the local usage has been abolished.

In the early period the liturgical language used at Rome was Greek, for Greek was spoken by the Roman Christians as well as by those of other centres of Christianity, such as Alexandria, Antioch, and Jerusalem. For example, Pope Clement I (c. 91–104) uses Greek in that famous 'First Epistle to the Corinthians,' to which reference has been already made, and the earliest inscriptions in the Roman catacombs are certainly in Greek. As far as is known, the first Christians to use Latin were those of Africa (Carthage). Pope Victor I (190–202), who was born in Africa, is often said to have been the first Roman pontiff to use it; but this has been disputed. The question turns on whether Victor or Saint Cyprian was the author of the treatise 'De Aleatoribus.' The 3d century popes, Cornelius (251–53) and Stephen (254–57), write in Latin. It may perhaps be fairly said that from about the 3d century Latin became the customary language spoken by Christians at Rome, and gradually from that time onward the only one. It is difficult to say when Latin replaced Greek for Church use. Some authorities place the change at as early a date as the second half of the 3d century; others are of opinion that Greek remained the liturgical language until the end of the 4th century. At all events, in Pseudo-Ambrose 'De Sacramentis' (c. 400) and in a letter of Pope Innocent I (401–17) to Decentius of Eugubium (c. 416) we find that the Mass was then said in Latin. It is probable that there was a transition period, during which the two languages were employed side by side. We know from the first Roman Ordo (c. 770) that as late as the 8th century lessons were read and psalms were sung in Greek. As a matter of fact, Greek has not, even now, entirely disappeared. We still have the Kyrie Eleison in every Mass and the Trisagion, Agios O Theos (O Holy God), Agios ischyros (O Holy Strong One), Agios athanatos, eleison imas (O Holy Immortal One, have mercy on us), in the Mass of the Presanctified on Good Friday.

The development of the Roman Mass into its present form is also difficult to trace, at least in some of its earlier stages. Clement I of Rome, Justin Martyr, Hippolytus, and Novatian are in substantial agreement as to the liturgies which they describe or mention; but our information as to the developments of the Roman rite during the latter half of the 3d and nearly the whole of the 4th century is extremely scanty. What we find is that between the 2d and the 5th century certain important changes were made. When we reach the 5th century we are on surer ground, for the 'De Sacramentis' and Innocent the First's letter to Decentius prove not only that the Mass was then said in Latin but also that it is in essence the rite still in use. In the 'Gelasian Sacramentary,' of the 6th or 7th century, showing the service considerably shortened, we have what is practically the present Roman Mass. Pope Saint Gregory I (590–604) made certain modifications, and left the Roman liturgy largely in the state in which it exists to-day. He it was, in particular, who gave the final touches to the Canon. "No pope," says Benedict XIV (1740–58), "has added to or changed the Canon since Saint Gregory." The Council of Trent (1545–63), wishing uniformity everywhere in the celebration of the Roman Mass, appointed a commission to examine and revise the Missal and restore it to its earlier form, "according to the custom and rite of the holy Fathers." This commission, named on 16 Feb. 1562, had not finished its labors at the close of the Council, 4 Dec. 1563, and its authority was continued and action on its report left to the Pope, Pius IV (1559–65). It was not, however, until the reign of his successor, Pius V (1566–72), that the revision was completed. On 14 July 1570 the reformed Missal — 'Missale Romanum ex decreto ss. Concilii Tridentini restitutum' — was published by the Bull, *Quo Primum*, commanding that that Missal alone should be used wherever the Roman rite is followed. That command put an end to most of the mediæval derived rites. There was, however, an exception. Any liturgy that could prove a prescriptive right by an existence of not less than two centuries was allowed. It is by virtue of this exception that the independent Gallican liturgies at Milan and Toledo, as well as the modified rites of certain religious orders and the local usages of some dioceses, were preserved. This Missal of Pius V is the one still in use. It has, however, since undergone various corrections in non-essentials. A second revised Missal was published by Clement VIII (1592–1605) by the Bull, *Cum Sanctissimum*, of 7 July 1604. Again on 2 Sept. 1634 Urban VIII (1623–44) by the Bull, *Si quid est*, published yet another revision. The last revision of the text, with a correction of the rubrics, was made by Leo XIII (1878–1903). His missal — 'Missale Romanum ex decreto ss. Concilii Tridentini restitutum, S. Pii V Pont. Max. iussu editum, Clementis VIII, Urbani VIII et Leonis XIII auctoritate recognitum' — was published in 1884. The

changes effected by Pius X (1903–14) have reference to the music.

Of the Mass, so instituted, developed, reformed, authorized, and promulgated, it remains to say a few words. It is, indeed, not within the scope of the present article to give in detail the many complicated rules and the minute rubrics that are to be observed in the celebration of Mass. These things, which must be mastered before ordination by every aspirant to the priesthood, are to be found fully set forth in books on ceremonial. All that can be given here is a general outline of the prayers and of some of the ceremonies used. The norm is Missa Solemnis, or High Mass, sung by celebrant, deacon, subdeacon, and choir. The following sketch therefore refers to High Mass and, further, to High Mass as celebrated on an ordinary Sunday. The procession, consisting of thurifer, acolytes, master of ceremonies, subdeacon, deacon, and celebrant, all appropriately vested in accordance with the rubrics, having reached the foot of the altar, the celebrant makes the sign of the cross, and he and his assistants say certain preparatory prayers, including the 42d [43d in Rev. vers.] Psalm and the Confiteor or General Confession. Going up to the altar, the celebrant says silently two short prayers asking forgiveness of his sins. Then, having blessed the incense and incensed the altar, he reads the Introit, consisting of an antiphon, a verse of a psalm, and the little doxology, Gloria Patri, etc. The Introit has previously been sung by the choir. The Kyrie Eleison follows, said by the celebrant and the assistant ministers, and sung by the choir. The celebrant then intones the first words of the great doxology, Gloria in Excelsis Deo, and he and the ministers say the remainder of it together, while the choir sings it. Turning to the congregation, the celebrant greets them, in his singing voice, with the salutation, Dominus vobiscum (The Lord be with you), to which the choir answers, Et cum spiritu tuo (And with thy spirit). He then sings the word, Oremus (Let us pray), and, turning his face to the altar, he sings the prayers known as the Collects, which are different every day. These are followed by the Epistle, which the celebrant reads while the subdeacon chants it. After the Epistle comes the Gradual, consisting of two separate chants, of which the first is the Gradual proper and the second is the Alleluia or, in Lent and on certain fast days, the Tract. Five times in the year, as well as in all Requiem Masses, the Gradual chants are followed by a canticle known as the Sequence. The celebrant then says silently the prayers, Munda cor meum, etc. (Cleanse my heart, etc.), and Dominus sit, etc. (May the Lord be in my heart and on my lips, etc.), reads a selection from one of the four Gospels, and blesses the incense. The subdeacon then holds the Gospel-book and the deacon incenses it, and then sings the Gospel as previously read by the celebrant. At the end the response, Laus tibi, Christe (Praise to thee, Christ), is said. At this point, a sermon, if there is one, is preached, in the vernacular of course. After the sermon, the celebrant intones the first words of the Nicene Creed, Credo in unum Deum (I believe in one God), and says the remainder, which is sung by the choir. When the singing of the Creed is finished, the celebrant sings Dominus vobiscum and, after the response as before, he sings the word Oremus (Let us pray). Then follow in order the three principal parts of the Mass, namely, the Offertory, the Consecration, and the Communion. The Offertory is the beginning of the action of sacrifice. While the choir sings the Offertory antiphon, the celebrant offers the bread, wheaten and unleavened, with the prayer, Suscipe, sancte pater, etc. (Accept, holy father, etc.). Then, blessing the water and mixing a little of the water with the wine in the chalice, he says the prayer, Deus, qui humanæ, etc. (God, who didst wonderfully create, and still more wonderfully renew, the dignity of man's nature, etc.). Next, offering the chalice, he and the deacon say, Offerimus tibi, Domine, calicem salutaris, etc. (We offer unto thee, Lord, the chalice of salvation, etc.). Bowing before the altar, the celebrant says the prayer, In spiritu humilitatis, etc. (In the spirit of humility, etc.), and then blesses the bread and wine with the prayer, Veni, sanctificator, etc. (Come, Sanctifier, etc.). He then blesses the incense and incenses first the bread and wine with the prayer, Incensum istud, etc. (May this incense, etc.), and then the altar with the prayer, Dirigatur, Domine, oratio mea, etc. (Let my prayer, Lord, be directed, etc.). Handing back the censer to the deacon, he says, Accendat in nobis Dominus, etc. (May the Lord enkindle in us, etc.). Here the celebrant, the ministers, the clergy present, and the congregation are all incensed. Washing his fingers at the side of the altar, the celebrant recites the Lavabo, that is, the last seven verses of Psalm 25 [26], concluding with the little doxology. Then, bowing before the middle of the altar, he says the prayer, Suscipe, Sancta Trinitas, hanc oblationem, etc. (Receive, holy Trinity, this oblation, etc.). He then turns to the congregation and gives the exhortation, Orate, fratres, etc. (Pray, brethren, etc.), to which the ministers make answer, Suscipiat Dominus sacrificium, etc. (May the Lord receive the sacrifice, etc.). Next follow the Secreta, or secret prayers, which, like the Collects, vary every day, but are said, not sung, by the celebrant. The last Secret, which ends the Offertory act, he brings to a close with the Ecphonesis, Per omnia sæcula sæculorum, sung aloud, to which the choir responds, Amen. There follow three short chants sung dialogue-wise by the celebrant and the choir. The celebrant then sings the Preface, which ends with the Sanctus, etc., said by him and sung by the choir. At the Sanctus a bell is rung thrice. The Canon, which is the fundamental part of the Mass, follows. Its form never varies, except for slight changes (1) when the Roman See is vacant, (2) when the Episcopal See is vacant, (3) when the Mass is celebrated (a) in Rome and (b) in some French churches, (4) when it is celebrated by (a) a Pope or (b) a bishop, (5) when a bishop is being consecrated, (6) on Maundy Thursday, and (7) at the time of the five chief feasts of the year, namely, Christmas, Epiphany, Easter, Ascension, and Pentecost. The Canon is said in a low tone (secreto) by the celebrant. He beseeches God to accept and bless the sacrifice, and to guard and protect the Church, the Pope, and the bishop; he prays for the living, present and absent; he commemorates the saints; he again

begs the acceptance of the sacrifice; he asks for peace and for deliverance from eternal damnation; he once more implores God to bless, approve, and ratify the oblation, so that it may become the body and blood of Jesus Christ. Then, reciting what Christ did with the bread the day before He suffered, he consecrates the Host by saying, secretly, plainly, and attentively, the words, Hoc est enim corpus meum (For this is my body). Immediately he genuflects on one knee and adores and elevates the Host, to show it to the people. Next, reciting what Christ did with the cup of wine, he consecrates the wine by saying the words, Hic est enim calix sanguinis mei, novi et æterni testamenti: mysterium fidei: qui pro vobis et pro multis effundetur in remissionem peccatorum (For this is the chalice of my Blood, of the new and eternal testament: the mystery of faith: which shall be shed for you and for many, for the remission of sins). Adding the words, Hæc quotiescumque feceritis, in mei memoriam facietis (As often as ye do these things, ye shall do them in remembrance of me), he again genuflects on one knee and adores the precious Blood and elevates the chalice containing it. During each elevation, a bell is rung thrice, additional lighted candles are borne by the acolytes, and the thurifer incenses thrice the consecrated bread and thrice the consecrated wine. Proceeding with the Canon, the celebrant says the Anamnesis prayer, in which a solemn commemoration is made of Christ's passion, resurrection, and ascension, and offers to the Lord the victim now on the altar, asking the Almighty Father to accept the offerings, and to command them to be carried by the hands of the holy angel to the altar on high, so that those who receive the most sacred Body and Blood of His Son may be filled with all heavenly blessing and grace. He next prays for the dead, prays again for the living, and makes a further commemoration of the saints, closing with the second Ecphonesis, Per omnia sæcula sæculorum. The answer, Amen, sung by the choir, brings the Canon to an end. Here follows that part of the Mass known as the Communion. The celebrant sings a short exhortation and clause, and then sings the Pater Noster as far as the word, tentationem. The choir sings the last petition, Sed libera nos a malo (But deliver us from evil). After this comes an Embolism, containing a further prayer for deliverance from evil and for peace, said by the celebrant, and ended by the third Ecphonesis, the words of which are the same as those of the two former ones. During the last part of the Embolism, he breaks the Host in the middle, over the chalice. Following the Ecphonesis and its response, he sings the greeting, Pax Domini sit semper vobiscum (May the peace of the Lord be always with you), to which the choir replies, Et cum spiritu tuo. Putting a particle of the Host into the chalice, with the prayer, Hæc commixtio et consecratio, etc. (May this mingling and consecration, etc.), he genuflects, bows down, strikes his breast thrice, and says the Agnus Dei, etc. (Lamb of God, etc.), which contains two petitions for mercy and one for peace. The choir sings the Agnus Dei. The celebrant, having made a further prayer for the peace and unity of the Church, gives the kiss of peace to the deacon, who in turn gives it to the subdeacon, and he in turn to the clergy present. The celebrant then prays for deliverance from his iniquities and from all evils, and asks that the participation of Christ's body may not turn to his judgment and condemnation, but may profit him to the safety and health of soul and body. Having said the words, Panem cœlestem accipiam, et nomen Domini invocabo (I will take the Bread of heaven, and will call upon the name of the Lord), he recites three times the Domine, non sum dignus, etc. (Lord, I am not worthy, etc.), a bell being rung each time, and, with specified and appropriate short prayers, he eats the consecrated bread and drinks the consecrated wine. During the two ablutions, that is, of the chalice and of his fingers, which follow, he says two other short prayers. While the choir sings the antiphon known as the Communion, the celebrant reads it, and this ends the Communion act. The last division of the Mass now begins. The celebrant, having sung the Post-Communion prayers, sings also the Dominus vobiscum, to which the choir gives the customary response. Then the deacon sings, Ite, missa est (Go, the Mass is ended), or, in penitential seasons, Benedicamus Domino (Let us bless the Lord), and the choir answers, Deo gratias (Thanks be to God). The celebrant says a final prayer, Placeat tibi, Sancta Trinitas, obsequium servitutis meæ, etc. (Holy Trinity, may the performance of my homage be pleasing to thee, etc.), and blesses the congregation. He then reads the last Gospel, which is normally the beginning of the first chapter of the Gospel of Saint John (vv. 1–14), and, when he finishes, the ministers respond, Deo gratias. So ends the Mass.

Low Mass (Missa privata), in which the celebrant supplies the part of the absent ministers and uses the speaking instead of the singing voice, is a late abridgment. It became a necessity when, in the early Middle Ages, the pious custom grew up for practically every priest to say Mass once a day. By the 9th century we find that many priests were in the habit of saying Mass several times the same day. By the 13th century this multiplication of Masses began to be forbidden. By special indult (1746) of Pope Benedict XIV, priests in Spain and Portugal were permitted to celebrate three Masses on All Souls' Day (2 November), a privilege extended quite recently to all other countries. The rule now is that, except on that day and on the feast of Christmas (25 December), when three Masses are also allowed, and on Sundays and certain holy days when, in case of necessity, authorization for two Masses is given, a priest may say only one Mass a day. Pius the Fifth's Missal (1570) recognized Low Mass and specifically arranged its order. By direction of Pope Leo XIII certain prayers in the vernacular, in which the congregation participates with the celebrant, are recited after every Low Mass. In some countries (e.g., Ireland) the 129th [130th] Psalm (De Profundis) is said after the Low Mass and before the vernacular prayers. There are special rites for a Pontifical Mass, high or low, and additional special rites for a Papal Mass. A Missa Cantata, without deacon and subdeacon, but with celebrant, choir, and singing as at High Mass, is a compromise. The Mass of the

Presanctified (Missa præsanctificatorum, λειτουργία τῶν προηγιασμένων), which is really not a Mass at all but a service of Communion from an oblation consecrated and reserved at a previous celebration, was once common in both the Eastern and the Western Church. In the Byzantine rite such a service still occurs several times in the year, but in the Roman rite it is now used only on Good Friday. Conventual or Chapter Mass (Missa conventualis or capitularis) is an official Mass celebrated in such churches as are bound to have the whole office every day. A Missa solitaria is a Mass said without an assistant. Such Masses, forbidden by many synods, may nevertheless be celebrated by dispensation given under special circumstances. Missa sicca, or dry Mass, was used on occasions when a real Mass could not be said, as, for example, at a wedding or a funeral in the afternoon. It consisted of the prayers of the Mass with the essential parts — offertory, consecration, communion — omitted. Varieties of the dry Mass were Missa nautica, said at sea when the rolling of the ship rendered a real Mass dangerous or impossible, and Missa venatoria, said for hunters. The dry Mass was in vogue from at least the 14th century, but by the end of the 17th century it was nearly entirely abolished. Requiem Mass is said for the dead, and Nuptial Mass (pro sponso et sponsa) for a marriage.

In the early ages the Mass was divided into two distinct parts, the Mass of the Catechumens (Missa catechumenorum) and the Mass of the Faithful (Missa fidelium). This distinction, at one time fundamental, gradually disappeared as the discipline of the catechumenate fell into disuse. It has now long been lost, and the division is so hidden in the present rite that but few people advert to it. The *Dominus vobiscum* and the *Oremus,* following the Gospel (or the Creed, when it is said) and preceding the Offertory Act, show the line of demarcation.

The celebrant of Mass must be in priest's orders and free of irregularity and censure. He must also be in the state of grace, and be fasting from at least the previous midnight. He is bound to observe the rubrics and the laws concerning the matter (azyme bread and pure wine), the vestments, the vessels, and the ceremonies. Mass should be celebrated in a consecrated or blessed church and on a consecrated altar or altar-stone. In special cases, however, it may be said in a private oratory or even in an ordinary room. It is offered in the morning, though, for good and sufficient cause, the time may be extended to a limited period after mid-day.

The two great distinguishing marks of the Roman Mass are (1) that it is a sacrifice and (2) that it supposes Transubstantiation. These were the two features to which the Reformers particularly objected. They took the position that "the Eucharist and Holy Supper of the Lord" was a remembrance of Christ and a solemn setting forth of his death, and not a sacrifice, and that Transubstantiation did not take place. They were anxious, indeed, to retain a Eucharistic service, but one stripped of what to them appeared to be its objectionable parts. They were also insistent that the service should be in the vernacular, and that communion, when administered to the faithful, should be administered under both kinds, that is, in the form of bread and wine, and not of bread alone as was the practice of the Catholic Church. At first they repelled the charge that they were opposed to the Mass, and the Augsburg Confession "protests against any notion that it abolishes Mass"; but the logic of events was too strong for this contention, and ultimately the Reformation, as far as it could, did away with the Mass. In his Latin Mass (1523) and his German Mass (1526) Luther put forth the basis of the numerous liturgies promulgated by his followers in the 16th century. In the former he laid down the principle that "we cannot deny that Mass and the communion of bread and wine is a rite divinely instituted by Christ." He therefore allows the Mass, as it stood in the ancient missals, to be consonant with primitive purity, except the Offertory and the Canon, that is, everything that savored of oblation. He did not recognize Transubstantiation. He developed instead the theory of Consubstantiation, according to which Christ's body and blood are really and corporeally present, during the celebration of the Lord's Supper, in, with, and under the substance of bread and wine, in a union not hypostatic, not of mixture, not of local inclusion, but wholly transcendent and mysterious, so that the elements may with propriety be termed either bread and wine or the body and blood of Christ. Zwinglius and Oecolampadius, and with them the main body of Helvetian Protestantism, went farther. They rejected all notion of a real presence, and recognized only figurative symbols in the elements which Christ had appointed as a commemoration of his death. Bullinger modified Zwinglius's doctrine without changing its essentials, and, by divesting it of its merely commemorative character and admitting the presence in the communion, gave it the form in which it was adopted by the Helvetic churches. Bucer did not acknowledge the local or real presence of Christ's body and blood in the bread and wine after consecration, but contended that the body and blood were really, and without figure, received by the worthy communicant, through faith. Calvin taught that the body of Christ is present in the Eucharist, but "dynamically," not objectively; that the believer partakes of it, but spiritually and by faith; that the elements are unchanged; and that therefore the Catholic Mass is idolatry. In England the Reformers maintained that in the Lord's Supper there is no Transubstantiation and no other oblation than a giving of thanks and a commemoration of the death of the Lord: in other words, that, as Cranmer phrased it, the Roman Mass is "heinous and abominable idolatry." These views found practical expression in the Book of Common Prayer, the first vernacular liturgy of the Church of England, published in the reign of Edward VI, and effective on Whitsunday, 9 June 1549. The Eucharistic part of the service was indeed named "The Supper of the Lorde and holy Communion, commonly called the Masse," but the whole of the oblation and offertory prayers were swept away and the former Canon changed in many of its most material parts. In the second Book of Edward VI, which went into force on 1 Nov. 1552, the word Mass was omitted, and any language in the Canon that might imply either the doctrine

of Transubstantiation or of sacrifice also disappeared. The attitude of the Anglican Church on this subject is crystallized in the 31st of the Articles of Religion: "Wherefore the sacrifices of the Masses, in which it was commonly said, that the Priest did offer Christ for the quick and the dead, to have remission of pain or guilt, were blasphemous fables, and dangerous deceits." Laws were enacted containing severe penalties for saying or hearing Mass. So important did it seem to condemn the Roman sacrifice that, for centuries, the occupant of the English throne was bound by the oath taken at coronation to repudiate the doctrine of Transubstantiation and of the Mass. It was not until 1910 that, by the Accession Declaration Act, the oath was purged of its objectionable clauses.

Modern unbelief, which denies the divinity of Christ and rejects every supernatural institution, does not of course recognize the sacred character of the Mass. Using the so-called historico-religious method, it accounts for the Eucharist and the Eucharistic sacrifice as a result of a spontaneous development in the religion founded by Christ; but this line of argumentation neither explains nor explains away the Mass, and succeeds only in raising still more difficult problems for solution.

Despite all the attacks to which it has been subjected, the Mass remains the great central act of sacrifice in the Catholic Church, the distinctive feature of the Catholic religion, the everlasting witness and guarantee of the bond which unites all Catholics with the Roman See. Catholics are required, under pain of grievous sin, to attend Mass on Sundays and holy days of obligation, unless prevented from doing so on reasonable grounds, such as sickness or too great distance from a church. Some lax Catholics, it is true, shirk their duty in this respect; but the crowded condition of the churches both in town and country in every land during the hours of celebration shows how generally and how generously the law is observed. In practice, multitudes of Catholics hear Mass and receive holy Communion every day.

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MASSA, mäs'sä, or **MASSA DI CARRARA,** Italy, the capital of the province of Massa e Carrara, situated on a hill three miles from the Gulf of Genoa, 25 miles north of Pisa and 20 miles by rail southeast of Spezia. It is an episcopal see, has a cathedral, public library, and academy of arts and sciences, and an ancient ducal palace now used as the prefectual building. The chief industry is the quarrying of the superior white marble in the vicinity; tobacco, silk, cotton, paper and oil are manufactured. Massa was once the capital of the principality of Massa and later capital of the duchy of the same name. In 1829 it was annexed to Modena. Pop. 30,830.

MASSACHUSET, măs-ą-choo'sĕt, a tribe of North American Indians of the Algonquian stock, formerly living in the neighborhood of Massachusetts Bay, between Salem and Plymouth. Their capital, Massachuset, was where Quincy now stands. A pestilence in 1617 greatly reduced their number and on the arrival of the white settlers the tribe numbered but a fraction of its former hosts, about 500. In 1633 this number was further depleted by the ravages of smallpox. They were placed by the whites in the missions of Natick, Nonantum and Ponkapog in 1646 and gradually disappeared. See ALGONQUIN; INDIANS.

MASSACHUSETTS, one of the 13 original States of the Union, and the most populous of the New England States; between lat. 41° 14′ and 42° 53′ N., and between long. 69° 55′ and 73° 32′ W. from Greenwich. Its greatest length is 184 miles and greatest breadth 113¾ miles, the average breadth being 47¾ miles. Capital, Boston. Population State census, 1915, 3,693,310, as compared with 3,666,416 shown in the National census of 1910. Its familiar name "The Old Bay State" is due to its location upon Massachusetts Bay, an inlet of the Atlantic Ocean which forms the eastern boundary of the State. It is bounded on the north by the States of New Hampshire and Vermont; on the west by the State of New York; on the south by the States of Rhode Island and Connecticut, together with the Atlantic which, skirting the southeastern coast, forms between the outlying islands of Martha's Vineyard and Nantucket, belonging to the State, a broad waterway known

as Nantucket Sound and an inlet called Buzzard's Bay, beyond the eastern extremity of Long Island Sound. The name "Massachusetts" is compounded from Indian words meaning "Great Hills Place," alluding probably to heights of land near the coast in the vicinity of Boston. The present State seal, adopted in 1780 in place of other devices previously in use, shows an Indian holding in his right hand a bow and in his left an arrow pointing downward, all of gold, displayed upon a blue shield, and in the upper corner, above the right arm of the Indian, a silver star having five points. The motto, adopted for Massachusetts by the Provincial Congress in 1775, is, in Latin, "*Ense petit placidam sub liberate quietem,*" or in English, "With the sword she seeks quiet peace under liberty."

Topography.— The area of the State comprises 8,315 square miles, 8,040 square miles being land surface, and 275 water. A portion of the Appalachian Mountain system forms two distinct ranges crossing the western part of the State from north to south. Of these, the Taconic range on the extreme western border has as its highest elevation Mount Greylock (3,535 feet) in the northwestern corner of the State, which is also the highest elevation found within Massachusetts. Thence the range falls to an elevation of 2,624 feet near the southwestern corner. The other or Hoosac range farther east has, as its highest peak, Spruce Hill (2,588 feet), its general height ranging, however, from 1,200 to 1,600 feet. Mount Tom (1,214 feet) and Mount Holyoke (955 feet) are conspicuous elevations rising above the valley of the Connecticut River. Mount Wachusett (2,108 feet) and Mount Watatic (1,847 feet) in the north central part of the State are also noteworthy. An elevated plateau, 1,100 feet high at its greatest elevation, forms the central portion of the State and slopes gradually toward the east, the highest point near the coast being the Great Blue Hill of Milton (620 feet). The sandy peninsula or arm of land known as Cape Cod is a distinguishing feature of the topography of the State, enclosing between the bend and the main coast the considerable body of water known as Cape Cod Bay. The arm of the cape is now penetrated by a ship canal shortening the route between the port of Boston and southern waters. The main coast line of the State, some 300 miles in extent, affords excellent harbors, especially at Boston, New Bedford, Gloucester and Salem. See BOUNDARIES OF THE UNITED STATES.

Rivers and Lakes.— The principal rivers are the Connecticut, crossing the State from north to south, approximately 40 miles east from the western boundary; the Housatonic, flowing south, and the Hoosac, north, between the Taconic and Hoosac ranges; and the Merrimac, in the northeastern part of the State, having its source in New Hampshire and flowing into the Atlantic on the eastern coast. These rivers, except the Merrimac for some 15 miles from its mouth, are not navigable for shipping; but together with the Deerfield, Westfield, Chicopee and Miller's River, branches of the Connecticut, the Nashua and Concord, branches of the Merrimac, the Blackstone flowing from the centre of the State southerly across the Rhode Island boundary, and numerous other small streams, afford water power of the highest efficiency which has been fully utilized in the industrial development of the State and contributed largely to the extension and growth of manufacturing, the chief source of the wealth of its people. The Mystic and Charles rivers, flowing into Boston Harbor, and the Taunton, entering the bay at Fall River, are tidal streams each navigable for a short distance inland. There are numerous small lakes or ponds throughout the State, adding much to the beauty of the landscape, and, in many cases, utilized as sources of water supply for the inhabitants.

Geology.— The rocks are principally metamorphic of the Archæan and Palæozoic systems. In the river valleys and elsewhere there are masses of glacial drift, including sand and boulders, some of the latter being of large size. No mineral deposits of great value exist, except stone for building purposes, limestone and sandstone of the highest quality being quarried in the Connecticut Valley and west of the Connecticut, and granite of several varieties and superior character at Cape Ann, Quincy, and to a lesser extent in other eastern sections. The elevations of the lower Connecticut Valley are composed of bolerites, feldspathic and calcareous gneiss. There are extensive Mesozoic sandstone beds and shales in the Connecticut Valley, with small areas of syenite on each side, and an area of gneiss extending easterly from the Connecticut to the central part of the State. Syenite and porphyry are found in the east; feldspathic gneiss and granite in Plymouth and Bristol counties; gneiss and hornblende schist in Middlesex County; syenite in Essex and Norfolk counties; carboniferous deposits in Bristol and Plymouth counties, and Cambrian, Silurian and Devonian limestones, quartzites, schists and slates west of the Connecticut.

Climate and Scenery.— The temperature is variable and, especially in the eastern parts of the State, subject to frequent and wide fluctuations. In the early spring easterly winds prevail upon the coast, which are peculiarly trying to persons of delicate constitution. The winters are moderately severe, although near the sea there is much milder weather, during the winter months, and the fall of snow is not excessive. The summers are frequently marked by periods of excessive heat and sometimes by prolonged drought. The mean average rainfall for the State is about 48 inches. The normal temperature rises above the freezing point at Boston about 7 March and the normal temperature of 60° for the day reaches Boston about 24 May. It falls to 60° about 25 September. Observations extending over 25 years show that upon the average experience the warmest week at Boston follows 13 July. On the other hand, the coldest week follows 24 February.

The scenery in the western counties is exceedingly picturesque, notably in the valleys of the Connecticut, Hoosac, Deerfield and Housatonic rivers. Here are found the noted Berkshire Hills. The northeastern coast line extending southerly from Cape Ann is bold and rocky, while the southern and southeastern shores of Cape Cod and Buzzard's Bay are low and sandy. The islands of Martha's Vineyard and Nantucket and the group known as the Elizabeth Islands partake of the characteristics of the neighboring mainland.

MASSACHUSETTS.

Established population, 3,719,156

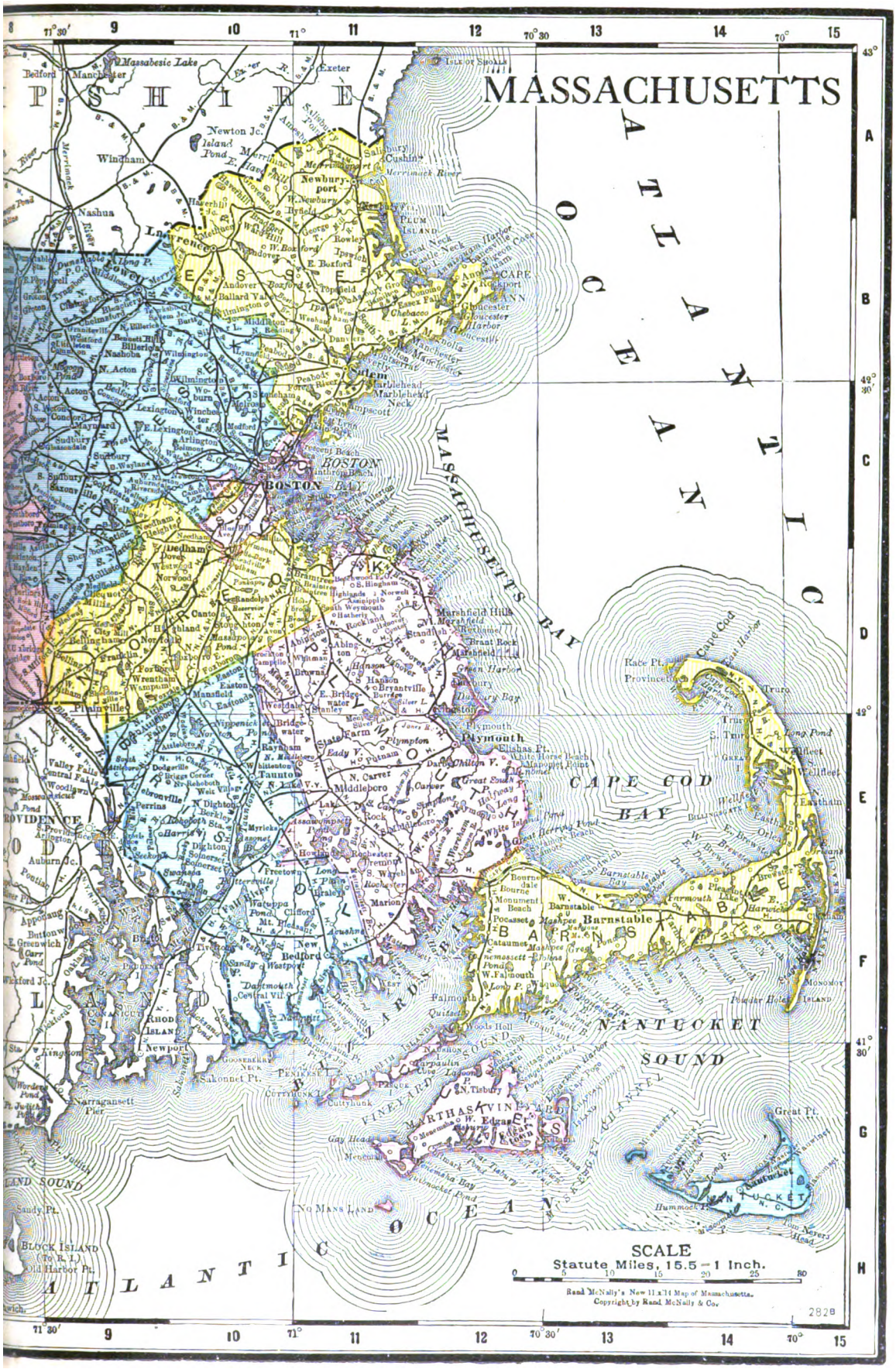
COUNTIES

Pop.			Pop.		
28,818	Barnstable	F 13	69,549	Hampshire	C 4
114,709	Berkshire	C 2	733,624	Middlesex	C 6
346,964	Bristol	E 10	3,166	Nantucket	G 14
4,904	Dukes	G 12	201,907	Norfolk	D 10
463,662	Essex	B 11	157,303	Plymouth	E 11
48,256	Franklin	B 4	826,801	Suffolk	C 10
262,944	Hampden	D 4	430,703	Worcester	C 7

Incorporated Cities, Towns, and Villages

5,646	Abington	D 11	17,445	Melrose	C 10
14,214	Adams	B 2	13,921	Methuen	B 10
10,157	Amesbury	A 11	9,048	Middleboro	E 11
5,558	Amherst	C 4	14,110	Milford	D 8
7,987	Andover	B 10	8,600	Milton	C 10
12,511	Arlington	F 2	7,925	Montague	B 4
9,461	Athol	B 5	10,102	Natick	C 9
19,282	Attleboro	E 10	6,542	Needham	C 10
8,081	Belmont	F 2	118,158	New Bedford	F 11
21,645	Beverly	B 11	15,243	Newburyport	A 11
5,689	Blackstone	D 8	43,715	Newton	C 10
756,476	Boston	F 4	22,035	North Adams	B 2
9,376	Braintree	H 4	5,956	North Andover	B 10
9,381	Bridgewater	E 11	19,926	Northampton	C 4
67,449	Brockton	D 10	11,014	North Attleboro	D 9
32,730	Brookline	G 3	9,918	Northbridge	D 8
112,981	Cambridge	C 10	9,605	Norwood	D 9
5,182	Chelmsford	B 9	5,379	Orange	B 5
46,192	Chelsea	C 11	9,119	Palmer	D 5
29,319	Chicopee	D 4	18,360	Peabody	C 11
13,075	Clinton	C 8	38,629	Pittsfield	C 1
6,681	Concord	C 9	13,743	Plymouth	E 12
9,949	Danvers	B 11	38,136	Quincy	C 11
10,433	Dedham	D 10	6,805	Reading	B 10
10,360	Easthampton	C 3	23,136	Revere	F 4
5,064	Easton	D 10	7,074	Rockland	D 11
39,233	Everett	C 10	48,562	Salem	B 11
6,277	Fairhaven	F 11	9,910	Saugus	E 5
128,366	Fall River	F 10	87,039	Somerville	C 10
41,781	Fitchburg	B 8	14,205	Southbridge	D 6
13,982	Framingham	C 9	5,994	Spencer	C 4
6,440	Franklin	D 9	105,942	Springfield	D 6
17,140	Gardner	B 7	7,489	Stoneham	C 10
24,478	Gloucester	B 12	6,982	Stoughton	D 10
6,250	Grafton	D 8	7,345	Swampscot	C 11
6,627	Great Barrington	D 1	36,283	Taunton	E 10
11,998	Greenfield	B 4	12,733	Wakefield	B 10
48,477	Haverhill	A 10	30,570	Waltham	C 9
65,286	Holyoke	D 4	9,094	Ware	C 5
6,758	Hudson	C 8	14,867	Watertown	F 2
15,507	Hyde Park	D 10	13,210	Webster	D 7
6,272	Ipswich	B 11	6,439	Wellesley	D 9
100,560	Lawrence	B 10	5,925	Westboro	C 8
20,839	Leominster	C 7	18,391	Westfield	D 3
113,245	Lowell	B 9	10,555	West Springfield	D 4
102,425	Lynn	C 11	13,882	Weymouth	H 5
51,155	Malden	C 10	7,520	Whitman	D 11
5,772	Mansfield	D 10	5,908	Winchendon	B 6
7,606	Marblehead	C 11	10,603	Winchester	E 3
15,187	Marlboro	C 8	12,692	Winthrop	F 5
6,770	Maynard	C 9	15,969	Woburn	C 10
26,234	Medford	C 9	163,314	Worcester	C 7

ENVIRONS OF BOSTON.
SCALE OF MILES.
0 ½ 1 2 3
VERMONT
NEW HAMPSHIRE
MASSACHUSETTS BAY
CONNECTICUT
BOSTON
Longitude West from Greenwich


MASSACHUSETTS
ATLANTIC OCEAN
MASSACHUSETTS BAY
BOSTON BAY
CAPE COD BAY
NANTUCKET SOUND
ATLANTIC OCEAN
SCALE
Statute Miles, 15.5 = 1 Inch.
0 5 10 15 20 25 80
Rand McNally's New 11 x 14 Map of Massachusetts.
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History.— The native inhabitants of Massachusetts were Algonquins of various tribes, each having its distinguishing name. The Indian nomenclature of hills, rivers, lakes and local districts is still preserved in many cases. The first fully authenticated visit of a European explorer is that of Bartholomew Gosnold in 1602, although there are traditional accounts of the visits of others, particularly of Northmen under Lief Erikson, some 600 years earlier, with subsequent settlements maintained during three centuries, of which, however, no undisputed traces exist, although a commemorative tower erected on the Charles near Boston is claimed to mark the site of a Norwegian settlement named Norembega. Gosnold skirted the coast from Salem southward, named Cape Cod and discovered the neighboring islands. A settlement made upon one of these was soon abandoned. Subsequent attempts at settlement by Prynne (1603) and Waymouth (1605) also failed. The Pilgrim Fathers, so-called, a company of English separatists who, seeking religious freedom, had, under the guidance of their pastor, John Robinson, left England for Leyden in Holland in 1607–08, sailed from Delfthaven in 1620, and soon afterward, 102 in number, from Plymouth, England, in the *Mayflower* (q.v.), with the intention of forming a settlement south of the Hudson River. Under stress of weather, however, they were forced to land in Provincetown Harbor 11 Nov. 1620, and finally upon the mainland at Plymouth 11 December (old style), where a settlement was established under a constitution or compact signed by all before leaving the ship, John Carver being chosen governor for one year. Despite much hardship this settlement was never abandoned and formed the basis of the Plymouth Colony.

A settlement made at Cape Ann in 1623 by English fishermen was in 1626 abandoned in favor of a location at Salem. A company of English Puritans under John Endicott, having obtained a grant of land on Massachusetts Bay, joined them in 1628. Under a charter granted the following year the colony of Massachusetts Bay was firmly established. In 1630 the colony received large accessions under John Winthrop, and the seat of administration was soon transferred, first to Charlestown and finally to Boston. These two colonies, Plymouth and Massachusetts Bay, advanced side by side, the last named growing in importance by constant accessions, although less tolerant than the former in religious matters. The original government was indeed theocratic, based upon the Congregational form of church government, which was established by law in 1651. A confederacy including the two colonies and that of Connecticut was formed in 1643, followed by one upon a somewhat broader basis in 1663.

In the Massachusetts Bay Colony religious intolerance was frequently exhibited during the early years. Roger Williams and others whose opinions were thought to be dangerous to the community were banished.

Troubles with the Indians, the original inhabitants of the country, involved both colonies, the more important being the Pequot War (1636–37). and the war with King Philip (1675–76). Gradually relations with the mother country became strained. After the restoration of Charles II a royal commission was appointed to administer the government, but was prevented from exercising its powers by the colonial authorities. The English High Court of Chancery in 1684 declared the charter of Massachusetts forfeited; and a succession of governors appointed by the Crown administered the colonial government, generally with much friction engendered by an adverse public opinion. Plymouth and Massachusetts Bay colonies were consolidated under a new charter in 1692. The territory of Maine, New Hampshire and Vermont formed part of the original province, separation being progressively accomplished and finally completed by the creation of the independent State of Maine in 1820.

In the colonial wars between France and England, and in difficulties with the Indians prompted by French influence adverse to the English colonies, Massachusetts was largely involved. Especially in the French and English wars (1744–48 and 1758), the colony took an important part, contributing in great measure to the success of the expedition against Louisburg and other Canadian campaigns. In these military operations, the colonists learned to estimate their strength justly and acquired experience which was of great value in the final struggle which resulted in independence.

Measures of taxation devised by the home government and restrictions upon the growing commerce of the colony led to a constantly increasing spirit of resistance and, finally, to riots in Boston (1765–68) against the enforcement of the Stamp Act (q.v.). In 1770 three citizens of Boston were shot by British soldiers, part of a garrison quartered upon the town without consent of the people. In December 1773 a cargo of tea, subject to a duty disliked by the colonists, was destroyed by being thrown into the harbor of Boston by a company of townspeople disguised as Indians. This episode is now widely known as "The Boston Tea Party" (q.v.). The port of Boston was closed in retaliation. The meeting of the General Court at Boston being postponed indefinitely, its members assembled at Salem. On 19 April 1775 the first blood of the Revolution was shed at Lexington not far from Boston, followed by the fight at Concord Bridge. On 17 June occurred the battle of Bunker Hill at Charlestown, which, although counted as a British victory, exhibited the effective strength and stubborn power of resistance of the colonial forces, who, about 1,200 in number, resisted more than 3,000 British regulars, only giving way when after the third assault their ammunition failed. Throughout the war Massachusetts took a prominent part, notwithstanding the emigration of a considerable number of loyalists to the eastern British provinces. She provided 67,907 troops and $820,000 in revenue. At the close of the war, Massachusetts entered the Union, its State constitution being adopted in 1780 and the Constitution of the United States ratified January 1788. In the naval operations incident to the war with England in 1812, the seamen from Massachusetts won especial credit.

The State was closely identified with the anti-slavery movement by the growth within her borders of a strong popular sentiment in favor of abolition. William Lloyd Garrison (q.v.), Wendell Phillips and many other prominent men were influential in this movement.

In the War of the Rebellion the State furnished 159,165 men to the Union army and navy, paying in bounties and interest on bounty loans more than $26,000,000, besides large sums in State and military aid. At the close of the war, the war debt of the State approximated $15,000,000. In the late war with Spain also, the quota from Massachusetts was promptly furnished, the men being among those first in the field. And in the great European conflict the State acted in conformity with its honorable traditions.

Population.— The yearly rate of increase in the population of the State is about 2 per cent. The industrial development of the last 40 years has stimulated the growth of factory towns and the population is now more than three-fourths urban, that is, concentrated in cities and towns having 8,000 population or more. Since there were, in 1910, upon the average, 418.8 persons per square mile of land surface the population is more dense than in any other State except Rhode Island. Although many persons born in Massachusetts have emigrated to other States, 356,337 such persons having been found in other parts of the country in 1910, nevertheless the loss has been more than compensated by accessions from abroad, from Canada and indeed from adjacent States of the Union. By the State census of 1915, the native born in the population numbered 2,541,265, and of foreign born, 1,152,045. The increase in the native born in 1915 as compared with 1905 amounted to 21.4 per cent as against 26.4 per cent increase in the foreign born.

The number of foreign born does not of itself fully indicate the effect of immigration upon the population. This is more clearly shown by the number of persons of foreign parentage, which in 1910 aggregated 2,221,497, white persons only being considered. Less than a half of the inhabitants therefore are now of wholly native parentage.

The following table (derived from the United States census of 1910, the latest date for which such a comparison is possible) shows the place of nativity of the more numerous classes among the foreign born, and also the number of persons in the population having one or both parents born in the countries named:

PLACE OF BIRTH	U. S. Census — 1910	
	Foreign born persons	Persons having one or both parents foreign born
All countries	1,051,050	2,221,497
Ireland	222,862	633,022
Canada (French)	134,659	295,282
Canada (other than French)	160,972	308,487
England	92,465	184,347
Sweden	39,560	68,468
Germany	30,554	77,728
Italy	85,056	130,577
Russia	117,260	176,499
Scotland	28,411	55,482
Portugal	25,445	41,431

Of the entire population 98.8 per cent was white in 1910, the remainder being persons of negro descent, Chinese, Japanese and Indians. The growth of population and its concentration have led to the incorporation of numerous cities, of which there are now 37 as against 317 towns. Although the towns numerically preponderate, nevertheless more than 70 per cent of the entire population is now under city government. Dense as the population is when considered in the aggregate this density is confined to the cities and towns engaged in manufacturing, or which share in the residential growth promoted by the metropolitan city of Boston, which of itself has extensive miscellaneous industries. The area of the cities and towns having a population in excess of 2,500 is, approximately, 3,395 square miles, and the population within such places shows a density of about 756.14 persons per square mile. Outside of these places there is in the Commonwealth an aggregate area of approximately 4,645 square miles of land surface, more than a half of the entire area of the State, containing a population of but 238,248, or an average of about 51.29 persons per square mile. Every census since 1875 has shown a considerable increase in population upon the territory occupied by towns above the 2,500 limit in 1900, and, conversely, an almost constant decline in the towns outside this area. The towns which have lost are the smaller agricultural towns of the State, and while the increase in the percentage of foreign born, proportionately to the total population, has been greater in these places than in the other cities and towns, nevertheless the population in them remains to-day as in 1875 largely native born. The persons of foreign birth rapidly become assimilated and take their place in the social and political as well as in the industrial life of the State. The presence of this element has been due very largely to the industrial development of the Commonwealth, but that part of it which appears in the smaller towns is due to the taking up of agricultural land by persons of foreign birth.

Incorporated Cities.— The table (page 403) shows the cities of the State, arranged in order of size, with the population, from the censuses of 1900 and 1910, and the State census of 1915. Boston, the capital, is the chief city of the Commonwealth and in the census of 1910 ranked fifth among the great cities of the Union. Identified with the growth of the State from its beginning its historical landmarks are of profound interest to the visitor, and the traditions of the city, its development in modern times, its unrivaled suburbs distinguished by large numbers of tasteful and well-kept residences, its beautiful parks, public buildings and points of literary and artistic interest, give it an important and in many respects a unique place among American cities. Other cities closely connected with the early history of the Commonwealth are Salem and Newburyport, located on the eastern coast in Essex County. Cambridge, near Boston, with which it is connected by several bridges spanning the Charles River, is the seat of Harvard University, and the former home of Longfellow and Lowell. Lowell and Lawrence upon the Merrimac, Fall River and New Bedford in Bristol County, and Holyoke in Hampden County, are all extensively engaged in textile manufacturing. Holyoke also, with Springfield, is especially inter-

NAMES OF CITIES	Population		
	1915	1910	1900
Boston	745,439	670,585	560,892
Worcester	162,697	145,986	118,421
Fall River	124,791	119,295	104,863
New Bedford	109,568	96,652	62,442
Cambridge	108,822	104,839	91,886
Lowell	107,978	106,294	94,969
Springfield	102,971	88,926	62,059
Lynn	95,803	89,336	68,513
Lawrence	90,259	85,892	62,559
Somerville	86,854	77,236	61,643
Brockton	62,288	56,878	40,063
Holyoke	60,816	57,730	45,712
Haverhill	49,450	44,115	37,175
Malden	48,907	44,404	33,664
Chelsea	43,426	32,452	34,072
Newton	43,113	39,806	33,587
Quincy	40,674	32,642	23,899
Fitchburg	39,656	37,826	31,531
Pittsfield	39,607	32,121	21,766
Everett	37,718	33,484	24,336
Salem	37,200	43,697	35,956
Taunton	36,161	34,259	31,036
Medford	30,509	23,150	18,244
Waltham	30,154	27,834	23,481
Chicopee	30,138	25,401	19,167
Revere	25,178	18,219	10,395
Gloucester	24,478	24,398	26,121
Beverly	22,959	18,650	13,884
North Adams	22,035	22,019	24,200
Northampton	21,654	19,431	18,643
Peabody	18,625	15,721	11,523
Attleborough	18,480	16,215	11,335
Leominster	17,646	17,580	12,392
Melrose	16,880	15,715	12,962
Woburn	16,410	15,308	14,254
Newburyport	15,311	14,949	14,478
Marlborough	15,250	14,579	13,609
Methuen	14,007	11,448	7,512

ested in the production of paper of all grades. New Bedford was formerly the seat of the whaling industry now almost entirely abandoned. Lynn and Haverhill in Essex County and Brockton, in Plymouth, are the centres of the boot and shoe industry. Worcester, the second city in point of size, well located near the centre of the State, is an educational centre as well, the seat of Clarke University and Holy Cross College, and is largely interested in high-class metal industries and the manufacture of machinery. Waltham, in Middlesex County, is the site of a large watchmaking establishment and has extensive textile factories. Northampton, in Hampshire, is the seat of Smith College for women. Woburn, in Middlesex, has large establishments for the production of leather. Gloucester, a seaport upon Cape Ann, is largely engaged in the fisheries. Quincy, in Norfolk County near Boston, has noted granite quarries. Fitchburg in Worcester County, Taunton in Bristol, North Adams and Pittsfield in Berkshire, Chicopee in Hampden, Beverly in Essex, and Marlborough in Middlesex, are all thriving cities with important industries; and Chelsea and Revere in Suffolk County, Everett, Somerville, Newton, Melrose, Medford and Malden in Middlesex, are rapidly growing municipalities, largely residential and closely connected with Boston within the metropolitan district.

Religion.— Originally, as elsewhere stated, Orthodox Congregationalism was the form of Church polity recognized by law. To-day all the principal denominations are represented. In respect to population, the Roman Catholics lead all others, more than 900,000 persons in the Commonwealth being of that faith. In church membership, the Orthodox Congregationalists rank next to the Roman Catholics, with approximately 115,000 members; followed by the Baptists (of whom there are several different bodies), with about 70,000; the Methodists (of different bodies), with about 60,000; the Unitarians, about 35,000; the Protestant Episcopalians, 30,000; and many other lesser bodies, of whom few, if any, exceed the limit of 10,000 in membership. These figures must all be regarded as below the actual, although relatively the bodies stand as stated. In the value of church property, although recent exact statistics are not available, and conclusions must therefore be based upon estimates, the rank of the several denominations is the same except that possibly the Roman Catholics change place with the Orthodox Congregationalists.

Government.—Originally based upon church membership, the conditions surrounding the suffrage have been subject to successive modifications. Dissenters from the Established Church were released from paying taxes for church purposes in 1815, and in 1833 all denominations were given equal standing before the law. Since the adoption of the original State constitution (1780) it has been three times revised by constitutional conventions held in 1820, 1853 and 1917–19. Numerous amendments to the original articles have been made and new articles adopted from time to time. All male persons, 21 years of age and upward, able to read and write in the English language, and neither paupers, imbeciles or convicts are entitled to vote. The State legislature, called the General Court, consists of the senate, 40 members, and the house of representatives, 240 members, elected in senatorial and representative districts respectively. Annual sessions are held beginning on the first Wednesday of January and continuing until prorogation after the completion of the business of the session. One of the most important articles in the recently revised Constitution provides for legislation subject to popular initiative and referendum, so that a specified number of voters by petition may initiate constitutional amendments and laws, or may require laws enacted by the General Court to be referred to the people for ratification or rejection.

The executive branch of the State government consists of a governor, lieutenant-governor, eight councillors who are the governor's constitutional advisers in the matter of appointments and other minor executive duties, and who are chosen in councillor districts, a secretary of the Commonwealth, treasurer and receiver-general, auditor of accounts and attorney-general. Beginning with the election to be held November 1920 these state officers and the members of the legislature, all of whom have heretofore been elected annually, will be chosen biennially; but annual sessions of the legislature will be continued as in the past. The governor is by virtue of his office commander-in-chief of the military forces of the State. He has a constitutional power of veto over the acts passed by the legislature, but, notwithstanding this, vetoed bills may be passed over the veto by a two-thirds vote of both branches. Important executive functions are

exercised by commissions of from one to three or more members, appointed by the governor, including among others the boards of agriculture; education; charity; conciliation and arbitration (dealing with labor disputes); the industrial accident board; the board of labor and industry; the commissioners of insurance; banks; waterways and public lands; the public service commissioners; the commission on mental diseases (lunacy); the bureau of prisons; the department of health; and the director of the bureau of statistics (controlling the census, social and industrial statistics), etc. The recently revised Constitution requires that. on or before 1 Jan. 1921, these commissions and boards, and all other executive and administrative work of the Commonwealth shall be organized in not more than 20 departments in which every executive and administrative office shall be placed, except those directly controlled by the governor and council. All judges are appointed by the governor and hold offices during good behavior. The judicial system comprises police, district and municipal courts, having original jurisdiction in minor civil and criminal cases, sometimes exclusive of the Superior Court and sometimes concurrent therewith; a Superior Court with original jurisdiction in higher cases, and original and concurrent jurisdiction with the Supreme Judicial Court; and a Supreme Judicial Court, which has general supervision over all courts of inferior jurisdiction, hears appeals, decides questions of law, etc. This court has also original jurisdiction in certain cases, and original and concurrent jurisdiction with the Superior Court in others. The Superior and Supreme Judicial Courts hold regular term sittings in the several counties. The judicial system also includes courts of probate and insolvency in each county, and there are trial justices and justices of the peace, with limited jurisdiction.

Cities are incorporated by special legislative charter, the minimum population required being 12,000. City governments are administered by a mayor and city council. Towns are independent municipal bodies other than cities, the chief executive officers being the board of selectmen, elected in town meeting by those entitled to vote. The town meetings also make appropriations and decide, by vote, other important matters relating to the affairs of the towns.

The cities and towns are grouped into counties, 14 in number, namely, Barnstable, Berkshire, Bristol, Dukes, Essex, Franklin, Hampden, Hampshire, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk and Worcester. The chief executive officers in the counties are county commissioners, elected annually.

Militia.— All able-bodied male citizens between the ages of 18 and 45 are in emergency liable to perform military duty. The ordinary State militia force consisted in 1916 (including officers) of land forces numbering 9,649 men, and a naval force of 842 men. These were organized in five regiments of infantry (in two brigades), one squadron of cavalry, one regiment of field artillery, one corps of coast artillery, one field battalion of signal troops, one corps of cadets, one naval brigade and a department of sanitary troops comprising one ambulance company, one field hospital company and sanitary detachments for the various regiments. During the late war, by special legislation, the land forces were much enlarged by a so-called home guard, recruited by voluntary enlistment.

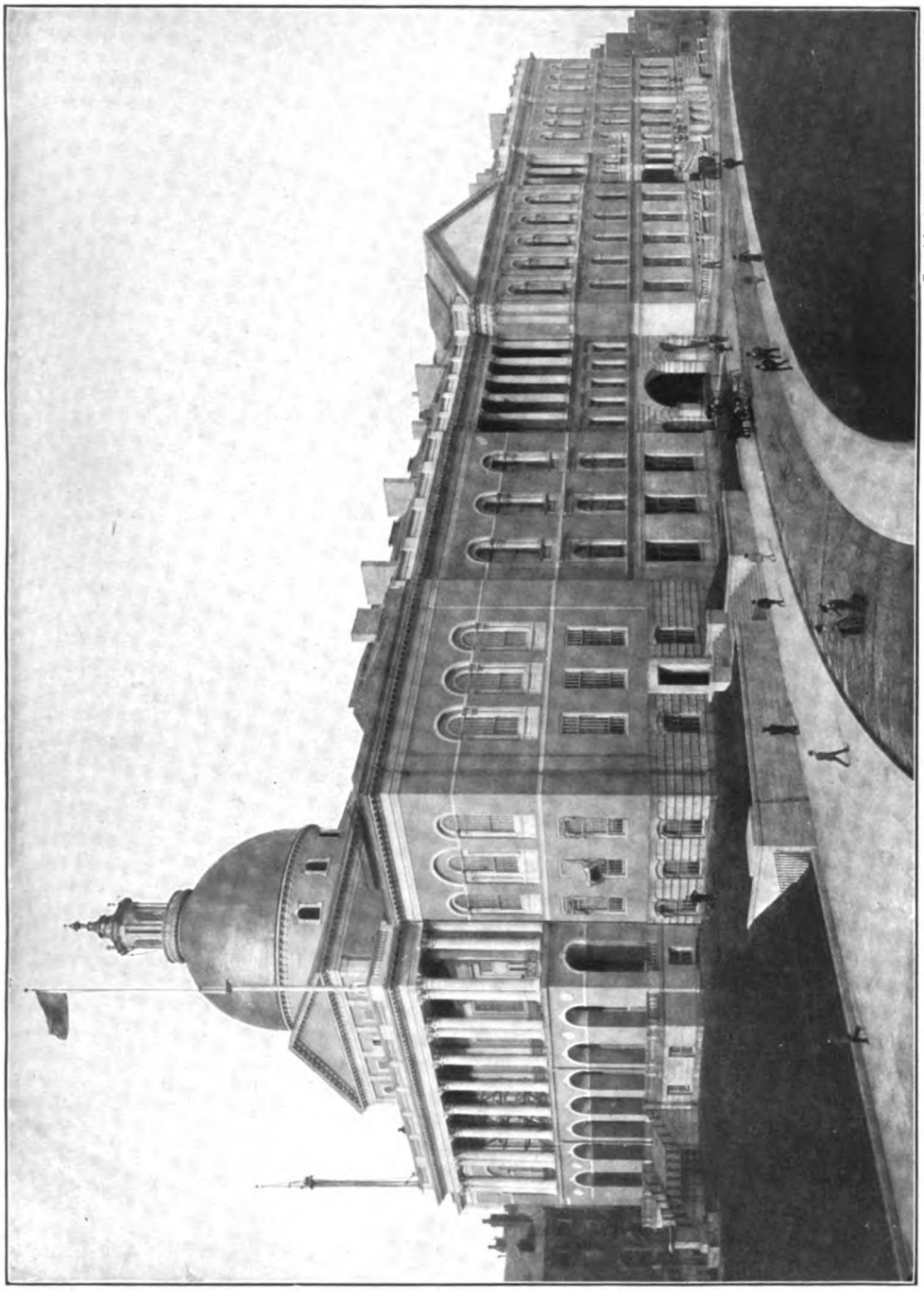
Wealth, Debt and Taxation.— Massachusetts is one of the wealthiest States of the Union. Much of the capital of its citizens is invested in enterprises out of the State. The value of real estate as fixed by the assessors of the various cities and towns for purposes of taxation was for the year 1918, $3,884,193,442. The total personal estate returned from the same sources was $850,260,497, bringing the aggregate to $4,734,453,939, and even this is probably an underestimate.

The aggregated tax levy for State, county and municipal purposes, for the year covered by the latest report, amounts to $95,138,742. Of this $2,087,046 is a poll tax assessed under a provision of law requiring the payment of such a tax, limited to $2 per capita, by every male inhabitant of the Commonwealth above the age of 20 years, whether a citizen of the United States or an alien. The rate of local taxation in the different cities and towns, per $1,000 of valuation, real and personal, varies from $2.50 to $42; rates from $2.50 to $9.80 being assessed in 11 towns; $10 to $14.60 in 52 towns; $15 to $19.80 in 6 cities and 122 towns; $20 to $24.70 in 26 cities and 107 towns; and $25 to $42 in 6 cities and 24 towns.

Under the tax system of the State real estate is taxed to the owner wherever residing, the tax being payable in the city or town where the estate is located. Taxes on tangible personal property are payable in the city or town where the holder resides, *but* a new statute in operation since 1917 taxes the income only of intangible personalty, and also income in excess of $2,000 from business, trade or profession, through the office of the State commissioner of taxation, the proceeds being distributed to the municipalities wherein the person taxed resides. Sworn returns are required under penalty.

Corporations are subject to a tax upon their capital stock, assessed and payable through the office of the State commissioner of taxation, the proceeds being distributed to the municipalities wherein the stockholders reside, in proportion to the amount of shares held by them respectively. Shares in such corporations are therefore exempted from local taxation. Real estate and tangible personal property in general is, on the other hand, subject entirely to local assessment, and, theoretically, at its full value. Property held solely for religious, charitable or educational purposes is exempt from taxation.

The State's bonded debt, less the amount of sinking fund applicable to its reduction, contracted for State purposes only, namely, loans for the construction of hospitals and other public buildings, the abolition of railway grade crossings, unpaid remainders of war debt, etc., amounted to $32,058,102 as reported 30 Nov. 1918. The Commonwealth carries temporarily an indirect indebtedness which, less sinking fund accumulation, amounted at the same date to $53,001,804, this representing loans contracted for the benefit of certain municipalities and metropolitan districts, within which the credit of the State was pledged to aid the development of parks, water systems, sewerage construction and armory construction, the com-



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State Capitol at Boston

munities benefited being assessed annually for the payment of interest, and finally for the payment of the principal. The net debt of the State, direct and contingent, was then $85,059,906, although, as will be seen, the larger part of this was contingent municipal indebtedness supported by the State credit.

Banks.— The report of the Comptroller of the Currency to September 1916 reports the number of national banks in the State as 155; 12 being in Boston. The total capital of the national banks in the State was $52,143,000, with $40,361,000 surplus, $707,823,000 total assets and $432,333,000 deposits. The total capital of the Boston national banks was $25,300,000, the surplus $23,950,000 and the deposits $199,095,000. This is a leading "reserve city." Trust companies doing a banking business in the State numbered 91, with $30,575,000 aggregate capital and $436,031,581 in deposits.

The banks for savings are governed by a carefully guarded statute, and these institutions as well as co-operative banks (co-operative savings and loan associations) and trust companies are under the supervision of the State commissioner of savings banks. The savings banks, at the close of the year covered by the latest published return (1917), numbered 196, the number of deposit accounts being 2,491,646; the amount of deposits, $1,022,342,583; the increase over the previous year being $24,647,765. The average amount to each account was $410.31, the deposits amounting on the average to about $263 to each person of the population. The savings banks throughout the State have been managed conservatively and very few losses have occurred; but the expense of management is remarkably low, the percentage of expense to total assets being but .287. The co-operative savings banks, which are really building associations, receiving deposits from their members in regular monthly payments, accumulating interest thereon, and loaning the amounts received to members only, principally upon first mortgages on real estate, have been uniformly successful and numbered (in 1917) 184, the shareholders numbering 247,725 and the assets amounting to $126,695,037.

The Massachusetts statute governing these institutions is a model in legislation of this kind, carefully protecting the interests of the members, who, by the method of regular savings inherent in the system, are gradually accumulating considerable sums in cash, or acquiring home ownership.

In their relation to commerce the financial interests of the State are largely centred in Boston. The first bank in this city, one of the earliest institutions of the kind in the country, was established in 1784 and still continues. Banking operations here have generally been conducted with conservatism and prudence. Since 1898 the aggregate banking capital invested in the city has been much reduced, and weak banks eliminated or strengthened by consolidation.

Education.— From the earliest years the education of the people has been a vital subject of public concern. Harvard College at Cambridge was founded in 1636, and as early as 1647 it was provided in the colonial laws "to the end that learning may not be buried in the graves of our forefathers" . . . "that every township after the Lord hath increased them to the number of fifty households, shall appoint one to teach all children to write and read; and when any town shall increase to the number of one hundred families they shall set up a grammar school, the master thereof to be able to instruct youth so far as they may be fitted for the University; provided that if any town neglect the performance hereof above one year, that every such town shall pay five pounds to the next school, till they shall perform the order." The spirit of this early law still continues. It has always been the policy of the Commonwealth to preserve the principle of local control of the schools, thus promoting the direct interest of the taxpayers in the several municipalities. Hence while the State law provides under penalty that schools shall be maintained in every city and town, these are administered by local boards termed school committees, elected by the people and clothed with broad general authority. Women, as well as male voters, may vote for the election of these officers. The State Board of Education, appointed by the governor, has advisory powers, intended to foster and promote the highest efficiency of the public schools, but no direct control of local schools, except in certain matters of general concern, such as the distribution of the income of the State school fund in aid of the schools in the poorer towns. This board through its agents exercises limited supervisory authority wherever aid is thus furnished. The board also directly administers the State normal schools established for training teachers. Such schools exist at Framingham, Westfield, Bridgewater, Salem, Worcester, Fitchburg, North Adams, Hyannis and Lowell, besides a State Normal Art School at Boston, expressly devoted to the training of teachers in drawing and the arts of design. The buildings provided by the State for normal instruction are of the highest character, of modern construction and all fully equipped. The number of pupils in attendance approximates 2,900.

School attendance is compulsory between the ages of 7 and 14, or if under 16 if certain educational standards have not been reached and specified requirements concerning education complied with. Public schools must be maintained at least 30 weeks in each year, providing instruction in specified subjects, except that in towns in which the taxable valuation of property is under $200,000, the time may be reduced to 28 weeks. Cities and towns containing 500 families must maintain high schools for at least 40 weeks annually, unless exempted by the State Board of Education for valid reasons, and under conditions fixed by the board. Towns not subject to this must pay for tuition of their children in the high school of some other municipality, but sums so paid are reimbursed by the State to towns wherein the valuation does not exceed $1,000,000, or if the valuation exceeds this amount but if the town contains less than 500 families, 50 per cent is reimbursed. If a town containing less than 500 families, nevertheless, maintains a high school of its own, the State grants to it $500 annually under certain conditions. Cities having 20,000 inhabitants must provide manual training. Cities and towns may establish industrial schools, and any city or town may, or under

certain industrial conditions affecting illiteracy, must maintain evening schools for instruction of persons over 14 years of age, and cities of 50,000 inhabitants must maintain evening high schools. Cities and towns may provide free lecture courses of educational value, and vacation schools are authorized, also nautical schools on shore or shipboard, and provision is made for State-aid vocational instruction, including agriculture, trades, crafts and manufacturing industries. A system of continuation schools provides for the education of illiterate minors between the ages of 14 and 16 who are at work. Municipalities must employ superintendents of schools, and provision is made for the joint employment of such superintendents by the smaller towns grouped in superintendentcy unions, aided by the State under certain conditions.

Children under 14 are not to be employed for wages while the public schools are in session, and unless certain educational requirements are complied with employment under 16 is prohibited in factories, workshops or mercantile establishments. There are also stringent provisions as to the employment of minors between 16 and 21, intended to prevent illiteracy. Indeed the educational requirements are so correlated with provisions as to employment and such effective means are provided for enforcement of the laws that the intellectual, moral and physical status of minors of either sex is carefully guarded. In every respect the legislation of Massachusetts of this character is upon a high plane.

There is a provision for the certification of the qualifications of high school teachers by the board of education, and a State-wide retirement system for teachers in the public schools, with annuities and pensions.

A department of university extension, under direction of the State Board of Education, organizes and maintains a comprehensive system of extension teaching designed to supplement, or to fill gaps in, other established educational agencies, by means of vocational and cultural classes conducted by part-time teachers or by correspondence courses. Many such courses are offered for classes when they do not duplicate educational opportunities given at nominal fees by other institutions. There are no fees for instruction in such classes. Twenty students must enroll in order to form a class.

The number of children attending the public schools during the year ending 30 June 1918, covered by the latest published returns, was 604,023; the average membership, 547,288, and the average attendance, 506,474, or 93 per cent of the average membership. At the same time there were 464,621 children in the State between the ages of 7 and 14. The law requiring school attendance is well enforced.

The total annual expenditure for public school support and outlay for the same year was $30,600,088, of which $3,929,213 was for new buildings, alterations and permanent repairs. Of the whole amount required for annual support about 97 per cent was derived from local taxation. The average cost to the towns in taxation was $48.73 for the school support of each child in the average membership, (not including outlay for new buildings) requiring an expenditure of $5.45 for each $1,000 of the State's valuation, or about 27 per cent of the average tax for all purposes.

The effective ventilation of school buildings is required under definite provisions of law enforced by the State inspector of factories and public buildings, and in the larger towns and cities these buildings are generally of the highest types of such edifices in this and in all other respects, large numbers having been erected within recent years.

The higher educational institutions within the State include the following: Harvard College (q.v.) at Cambridge, founded 1636; Williams College (q.v.) at Williamstown, 1793; Amherst College (q.v.) at Amherst, 1825; Mount Holyoke College (q.v.), for women, at South Hadley, 1837; College of the Holy Cross at Worcester, 1843; Tufts College (q.v.) at Medford, 1850; Massachusetts Institute of Technology at Boston, 1861; Boston College at Boston, 1863; Massachusetts Agricultural College at Amherst, 1863; Worcester Polytechnic Institute at Worcester, 1865; Boston University at Boston, 1869; Wellesley College (q.v.), for women, at Wellesley, 1870; Smith College (q.v.), for women, at Northampton, 1871; Clark University and Clark College at Worcester, 1887–1902; Simmons College at Boston, 1899; Massachusett College of Pharmacy at Boston, founded 1823, incorporated 1852; Middlesex College of Medicine and Surgery at Cambridge, founded 1846, incorporated 1850; Massachusetts College of Osteopathy at Cambridge, established 1897, incorporated 1898; Wheaton College at Norton, founded 1834, incorporated 1912, and Northeastern College at Boston, 1916. Radcliffe College at Cambridge and Jackson College at Medford having certain affiliations with Harvard and Tufts, respectively, but no legal connection with them, are devoted to the collegiate education of women, and there are also many seminaries and private schools of various grades in the State.

Libraries.— Free public libraries form an important element in the educational equipment of the State. These institutions, free to all the citizens in the various cities and towns, are practically universal, only a fractional percentage of the population being without such privileges. The establishment of such libraries has in recent years been fostered by grants of money from the State treasury, and by the creation of a Free Public Library commission, appointed by the governor, established to promote public library usefulness and to aid in founding such institutions where not then existing. This commission makes annual reports to the legislature upon matters within its jurisdiction. There are also numerous circulating and association libraries, not free to the public. The latest returns from the public libraries within the State show more than 400 such libraries, containing about 6,700,000 bound volumes and having a circulation for home use of more than 14,033,000 volumes. The annual appropriation from taxes for such libraries by the various cities and towns totaled about $1,355,600. The Boston Public Library, housed in a building which is one of the most noteworthy architectural monuments in the United States, is (except New York) the largest free public circulating library in the country, and contains about 1,175,000 volumes; the Harvard University Library has more than 1,230,000; the Bos-

ton Athenæum, 265,000; and the public libraries at Springfield and Worcester; the State Library in the State House at Boston, and that of the American Antiquarian Society at Worcester, each exceed 200,000 volumes. (See LIBRARIES).

Charitable and Penal Institutions.— The State institutions dealing with the defective classes include hospitals for the insane at Worcester, Taunton, Northampton, Danvers, Westborough, Medfield, Monson, Boston, Foxborough and Grafton; a State colony at Gardner, the Massachusetts School for Feeble-Minded at Waltham and the State school at Wrentham. These institutions are under the general supervision of the State Board of Insanity and directly controlled in each case by a board of seven trustees, of whom five must be men and two women, one to be appointed annually by the governor and council, the place of the senior member being vacated each year.

General remedial institutions include a State hospital at Pondville for inebriates and victims of drug habits, seven trustees; the hospital cottages for children at Baldwinsville, with five trustees; the Massachusetts Charitable Eye and Ear Infirmary at Boston, two trustees on behalf of the State; the Massachusetts General Hospital, four trustees on behalf of the State; the Massachusetts Homœopathic Hospital at Boston, five trustees on behalf of the State; the Peter Bent Brigham Hospital at Boston, two trustees on behalf of the State. There are several sanitariums for consumptives under a State board of seven trustees. All the State trustees are appointed for fixed terms by the governor. The Perkins Institution and Massachusetts School for the Blind at Watertown has four trustees on behalf of the State, similarly appointed; and the Soldiers' Home at Chelsea, three. There are special educational institutions for the deaf in which the State is interested and to which educable children of this class may be sent, in accordance with the policy of the Commonwealth which makes schooling free for all its children even when physical defects of this nature forbid their attendance upon the public day school. These comprise the American School for the Deaf at Hartford, Conn.; the Clarke School for the Deaf, Northampton; the Horace Mann School for the Deaf, Boston; the Sarah Fuller Home for Little Deaf Children, Medford; the New England Industrial School for Deaf Mutes, Beverly, and the Boston School for the Deaf. The Massachusetts Hospital School at Canton provides for the care and education of crippled and deformed children. The penal and reformatory institutions include the Lyman School for Boys at Westborough; the State Industrial School for Girls at Lancaster, and an Industrial School for Boys at Shirley, all controlled by the trustees of training schools, appointed by the governor; the State Prison at Boston (Charlestown district); the Massachusetts Reformatory at Concord; the Reformatory Prison for Women at Sherborn, and a prison camp and hospital at Rutland, all under the general supervision of the State director of prisons.

The State institutions for paupers include the State Infirmary at Tewksbury and the State Farm at Bridgewater.

The local poor, having settlements under the law in the cities and towns, are cared for in local almshouses maintained by the municipalities. There are jails, houses of correction and truant schools in the counties. The charitable institutions established and maintained by religious bodies or other private agencies are widely distributed; and, especially, hospitals for the treatment of accidents and disease, and homes for the aged have, in recent years, been numerously established throughout the Commonwealth.

By the latest returns covering the year ending April 1918, the total number of persons receiving public charity relief, of all grades (i.e., supported or relieved in institutions, in families or in their own homes, but not including vagrants and wayfarers), was 83,562. The paupers in State institutions numbered 10,626, and the city and town poor in local almshouses, 7,451. The total net cost of pauper relief for the year was $5,168,294, or about $1.34 to each inhabitant of the State. For the year ending 1 Feb. 1919 the whole number of insane persons in the State in care of the State Commission on Mental Diseases was 15,231, besides 3,953 other mental defectives, chiefly feeble-minded. (See PAUPERISM).

The total prison population 1 March 1919 aggregated 4,031; of whom about one-half were confined in county jails and houses of correction and the rest in the State prisons.

Vital Statistics.— Upon the estimated population of the State, the birth rate per 1,000 of persons living, for the year 1916 the latest for which complete figures are available, was 24.8; the marriage rate 18.2, and the death rate 14.9, the excess of births over deaths per 1,000 of persons living being 9.9. The death rate is slightly higher in the cities than in the towns. The total number of deaths for the year was 56,366, the number under each of the principal classified causes being as follows: From general diseases, 14,111; diseases of the nervous system and organs of special sense, 5,774; of the respiratory system, 7,859, and of the digestive system, 5,071.

Manufactures.— The State is largely devoted to manufacturing, the energies of its people having been early turned in this direction, and developed by more than a century of industrial training. No special advantages exist based upon the possession of raw material, or due to natural resources, except water power, which, although changes in the methods of developing power render this less essential than formerly, is still an important factor. The climate of the southeastern part of the State is especially favorable to cotton spinning. In colonial days much was done to foster manufactures, invention has been promoted and improved craftsmanship stimulated, and the effect has been significant throughout the industrial history of the State. The power loom, first constructed by Francis C. Lowell of Boston and Paul Moody of Amesbury, and put in operation at Waltham in 1814, revolutionized the cotton industry in the United States. The first cotton mill in the country was built at Beverly in 1788. As early as 1815 there were 57 cotton mills in the State with 46,650 spindles. The first attempt at woolen goods manufacture was at Rowley, in Essex County, in 1643, followed by more or less successful efforts in the same direction elsewhere in the State in the 17th and 18th centuries. The industrial his-

tory of Lowell, Lawrence and Fall River is, in effect, the history of the growth of the factory system as applied to textiles in America. The boot and shoe industry, developing from crude hand process of early times to the perfected factory operations of to-day, is interwoven with the story of the growth of Lynn, Haverhill, Brockton and many smaller municipalities. The first printing done in the American colonies was at Cambridge in 1639; and from this small beginning onward the printing and publishing business has been important in the State. Much of the history of paper-making in the United States is the history of the industry of Massachusetts. The manufacture of india rubber goods in this country originated at Roxbury, now part of Boston, in 1833. Manufactures of metal, machinery of all kinds, wooden goods, jewelry, clothing, cordage, rattan and other furniture have always been important.

The following table shows the returns, according to the census of 1915, covering the returns of the previous year, of all industries in the aggregate and of the principal industries in detail:

INDUSTRIES	Number of establishments	Capital	Wage earners		Value of product
			Average number	Total wages	
All industries	12,013	$1,548,960,733	606,698	$341,309,517	$1,641,373,041
Boots and shoes, including cut stock and findings	884	116,037,821	85,114	51,006,829	255,188,013
Boots and shoes (rubber)	9	23,027,061	8,087	4,468,411	23,788,788
Carriages and wagons	149	2,866,562	1,245	709,379	2,627,575
Clothing	418	12,141,437	11,840	16,697,908	30,206,346
Confectionery (and ice cream)	276	11,640,834	7,262	3,041,509	22,934,744
Cordage and twine (and jute goods)	13	18,780,156	6,073	2,455,637	20,229,992
Electrical apparatus and supplies	91	45,067,320	17,125	10,651,133	43,869,294
Foundry and machine shop products	724	99,707,910	34,398	23,497,652	70,974,440
Furniture	134	18,970,795	6,813	3,960,588	13,826,765
Iron and steel	57	20,095,865	6,097	3,888,253	18,565,912
Jewelry	202	14,521,053	6,505	3,888,999	14,175,857
Leather	126	47,418,119	10,164	5,918,205	45,265,434
Liquors, malt	26	22,373,787	2,106	1,992,322	15,608,044
Lumber, including planing mill products	475	12,433,568	5,048	3,367,568	15,029,841
Paper and pulp	86	47,979,966	13,401	7,548,620	43,352,545
Printing and publishing	1,206	37,264,950	13,214	10,278,542	47,574,600
Rubber goods, not otherwise specified	42	17,345,185	4,743	2,845,043	23,011,349
Slaughtering and meat packing	46	18,470,685	3,233	1,893,645	51,724,520
Textiles*	537	487,043,677	201,939	94,225,033	394,525,236

* Embracing the following with product as specified: Cotton goods, $195,481,626; woolen and worsted goods, $127,351,434; wool scouring, $1,406,674; hosiery and knit goods, $17,357,319; silk and silk goods, $10,676,681; wool shoddy, $1,903,016; dyeing and finishing textiles, $22,455,086; hats, fur, felt, $864,722; carpets, other than rag, $10,981,344; linen goods, $3,050,254; felt goods, $2,997,080.

In textiles, the most important industrial group shown in this table, the cotton industry leads with a product value of $195,481,626. The spindles employed in this industry numbered, in 1900, 7,784,687, increasing 1,960,169, or 33.7 per cent since 1890, being 40.6 per cent of the total increase in the country. In 1910 Massachusetts had 9,375,004 cotton spindles, and its spindles and looms in the industry approximated one-half of those in the country, and the State is first in rank among the States in the manufacture of cotton goods. The State led all others in the manufacture of woolen and worsted goods, the annual product in 1915 reaching $127,351,434. It also holds first place in the boot and shoe industry, the figures being shown in the table. It has long been first in the manufacture of fine writing papers, the value of this product approximating three-fourths of the total produced in the United States. The paper used by the national government for currency and bonds is produced within the borders of Pittsfield, but near the Dalton line, in a mill especially devoted to its manufacture. In the production of rubber boots and shoes the State ranks first, and in the manufacture of jewelry is preceded only by Rhode Island and New York. The labor employed in the factories of the State is highly skilled, its operations well organized and its productive capacity correspondingly high. Labor difficulties have not been numerous nor protracted. The factory legislation, as a whole, is in advance of other States, and is well enforced, being supported by an effective public opinion. The laws against the employment of children (referred to under *Education*) are especially stringent, and such employment is reduced to small proportions. There is provision for efficient factory inspection under the State Board of Labor and Industries, with a corps of inspectors covering all parts of the Commonwealth.

Agriculture.— The agriculture of the State, as compared with that of the great farming States of the West, is not important. The industry has always been secondary to manufacturing. Following the lines of least resistance, it has turned chiefly to the production of milk, eggs, poultry and such vegetables as find a ready market in the growing factory towns and cities almost at the farmer's door. Considered from this standpoint and measured by the value of the product annually sold, no decline is shown in recent as compared with earlier years. For example, the total value of product for the year covered by the United States census of 1910 was $42,298,274 as against $28,072,900 returned 10 years previously. The returns in the State census are more favorable than those secured in the national enumeration, since taken in the autumn and possibly with greater care; but inasmuch as comparisons with other States can only be made by using the national figures,

they will be relied on here. The total number of farms (1910) was 36,917; and the total acreage, 2,875,941, of which 1,164,501 was improved. The farm property was valued as follows: Land and improvements, except buildings, $105,532,216; buildings, $88,636,149; implements and machinery, $11,563,894; live-stock, $20,741,366. The animals upon the farms in the State, 15 April 1910, included 252,416 neat cattle; 64,283 horses; 10,009 lambs (under one year); 32,708 sheep (one year and over); 103,018 swine, and poultry valued at $1,492,961. The total value of domestic animals on farms was $19,208,712. The persons, 10 years of age and over, engaged in agriculture, forestry and animal husbandry numbered 74,666, and the agricultural laborers (working out) 4,515. The farms operated by owners, part owners or managers constituted 91.9 per cent of the whole number, only 8.1 per cent being carried on by tenant farmers. The State ranked twelfth among the States with respect to the number of farms which derive their principal income from dairy produce, and the total dairy product for the year amounted to $15,187,774, the amount sold being $14,840,927, the remainder being consumed on the farms. The value of milk sold was $13,297,634; cream, $475,824; butter and butter fat, $1,063,859; and of cheese, $3,610. The total value of poultry raised and sold during the year was $1,287,829; and the egg product aggregated 13,305,540 dozen. About 55,000 acres were devoted to cereals, the product in 1910 being valued at but $1,617,131, only a small per cent of the total crop value. Of the principal cereals the acreage and bushels produced in 1910 are corn, 41,755 acres, 2,029,381 bushels; oats, 7,927 acres, 268,500 bushels; rye, 3,474 acres, 59,183 bushels; barley, 349 acres, 9,021 bushels; buckwheat, 1,630 acres, 32,926 bushels; wheat, 109 acres, 2,404 bushels. The acreage devoted to hay and forage crops, exclusive of cornstalks, was 519,503, and the value of the crop, $11,280,989. Certain sections of the State are devoted to special products of considerable importance. Among these are tobacco raised in the Connecticut Valley, cranberries in Barnstable County and general market produce in parts of Middlesex County near Boston.

The Fisheries.— The fishing industry has, from the earliest years, been an important element in the prosperity of the coast towns and the hardy seamen of Gloucester and Marblehead, engaged in this industry in times of peace, have won renown in the naval operations of the country in times of war. The latest complete returns relating to the fisheries of the State show 8,780 vessels engaged valued at $3,680,163, with apparatus valued at $891,213, and the following annual product: Food fish, $7,580,789; mollusks, $1,509,200; crustaceans, $447,167; aggregating $9,537,156. The total number of persons engaged in the fisheries was 11,814. Of the value of the vessels, 39.51 per cent; of apparatus, 27.21 per cent; and of food fish product, 44.69 per cent are credited to the city of Gloucester; New Bedford having 8.42 per cent of the value of vessels, 7.06 per cent of the value of apparatus and 2.35 per cent of the food fish product, besides $217,987 product of the whale fishery. Provincetown had 5.41 per cent of the value of vessels, 13.07 per cent of apparatus and 8.96 per cent of food fish, besides $4,500 product of the whale fishery. Boston had 24.11 per cent of the value of vessels, 13.67 per cent of apparatus and 33.88 per cent of the food fish product.

Commerce.— By the statistics of 1916, fairly reflecting normal conditions preceding the late war, the total imports of the Massachusetts Customs District amounted to $210,900,943, or 9.60 per cent of all imports to the country. The exports amounted to $131,221,946, or 3.03 per cent of all exports. There were entered during the year 146 sailing and 240 steam vessels (American), having 439,484 total tonnage; and 269 sailing and 839 steam vessels (foreign), having 1,981,163 total tonnage. The vessels cleared numbered 129 sailing, 175 steam (American), total tonnage 322,085; and 272 sailing, 561 steam (foreign), total tonnage, 1,267,436.

Boston, of course, is the chief port of entry, and in the aggregate value of investments and earnings derived from ocean commerce exceeds all others. The city is extensively engaged in European commerce, much of which is conducted under foreign flags. Lines of passenger and freight steamers regularly ply between Boston and European ports, and the coastwise passenger and freight traffic to the east and south is important.

Railroads.— Transportation facilities have kept pace with the industrial development of the State. Boston, the metropolis, is connected with the West by two railway systems, and these communicate either directly or by branches with all the leading industrial centres. One general system, with its various divisions, communicates with the South by way of New York, uniting important manufacturing cities and towns, while a network of main and branch lines connects the northern and eastern factory centres of the State with each other, with the seaboard and with the railway systems leading south and west. There are in the State 2,141 miles of main and branch railroad line, besides 1,072 miles of second, third and fourth main track, and 1,755 miles of side track, making the total length of railroad track within the State 4,968.

Various companies as originally chartered are now operated (under leases) in three general systems, the Boston and Albany, Boston and Maine and the New York, New Haven and Hartford. The Boston and Maine system, after receivership, has recently (1919) undergone reorganization. The gross assets of the companies, 31 Dec. 1916, aggregated $863,525,164, and the gross liabilities $833,908,990. The total gross revenue from operation for the year was $163,463,010; and the total expense of operation, $110,802,255; yielding $52,660,755 net. Electrical street railways have multiplied until they now connect all of the principal cities and towns. In the city of Boston subway and elevated railway construction of the highest class, completed and in process, has already transformed the methods of street transit, and will finally solve the problem of rapid communication between different parts of the city and its suburbs. The Massachusetts street railway companies now own, according to the returns, year ending 31 Dec. 1916, 2,357 miles of main track, 529 miles of second main track and 196 miles of side track, these aggregating 3,082 miles. The gross assets of these companies aggregate $229,308,549. The total operating revenue for the year amounted to $43,150,201, and the total expense

of operation to $30,753,333. In recent years the prosperity of both steam and street railroads has been curtailed by causes which it is hoped are temporary. The street railways have especially felt the increase in operating expenses due to advancing wages and cost of supplies, without proportionate increase in revenue, since to a large extent they have been confined to fixed rates of fare. And the principal systems are now (1919) operating under remedial legislation, involving the principal of service at cost, with State control and, to a certain extent, guaranteed returns upon invested capital.

GOVERNORS OF MASSACHUSETTS.

GOVERNORS OF PLYMOUTH COLONY

Chosen annually by the People

1620 Nov. 11, John Carver.
1621 April —, William Bradford.
1633 Jan. 1, Edward Winslow.
1634 Mar. 27, Thomas Prence.
1635 Mar. 3, William Bradford.
1636 Mar. 1, Edward Winslow.
1637 Mar. 7, William Bradford.
1638 June 5, Thomas Prence.
1639 June 3, William Bradford.
1644 June 5, Edward Winslow.
1645 June 4, William Bradford.
1657 June 3, Thomas Prence.
1673 June 3, Josiah Winslow.
1680 Dec. 18, Thomas Hinckley.*

GOVERNORS OF MASSACHUSETTS BAY COLONY

Chosen annually under the First Charter

1629 Mar. 4, Matthew Cradock.†
1629 April 30, John Endicott.†
1629 Oct. 20, John Winthrop.†
1634 May 14, Thomas Dudley.
1635 May 6, John Haynes.
1636 May 25, Henry Vane.
1637 May 17, John Winthrop.
1640 May 13, Thomas Dudley.
1641 June 2, Richard Bellingham.
1642 May 18, John Winthrop.
1644 May 29, John Endicott.
1645 May 14, Thomas Dudley.
1646 May 6, John Winthrop.
1649 May 2, John Endicott.
1650 May 22, Thomas Dudley.
1651 May 7, John Endicott.
1654 May 3, Richard Bellingham.
1655 May 23, John Endicott.
1665 May 3, Richard Bellingham.
1672 Dec. 12, John Leverett (acting).
1673 May 7, John Leverett.
1679 May 28, Simon Bradstreet (to May 20, 1686).

THE INTER-CHARTER PERIOD.

May 25, 1686, Joseph Dudley became president of New England under royal commission, holding the office until 20 December, the same year, when Sir Edmund Andros became governor of New England, appointed by King James II. On 18 April 1689, Governor Andros was deposed by a revolution of the people. After the dissolution of the first charter, Simon Bradstreet was governor from 7 June 1689 to 16 May 1692.

GOVERNORS OF THE PROVINCE OF MASSACHUSETTS BAY

Appointed by the King under the Second Charter

1692 May 16, Sir William Phips.
1694 Dec. 4, William Stoughton (acting).
1699 May 26, Richard Coote (Earl of Bellomont).
1700 July 17, William Stoughton (acting).
1701 July 7, The Council.
1702 June 11, Joseph Dudley.
1715 Feb. 4, The Council.
1715 Mar. 21, Joseph Dudley.
1715 Nov. 9, William Tailer (acting ‡).
1716 Oct. 5, Samuel Shute.
1723 Jan. 1, William Dummer (acting).
1728 July 19, William Burnett.
1729 Sept. 7, William Dummer (acting).
1730 June 11, William Tailer (acting).
1730 Aug. 10, Jonathan Belcher.
1741 Aug. 14, William Shirley.
1749 Sept. 11, Spencer Phips (acting).
1753 Aug. 7, William Shirley.
1756 Sept. 25, Spencer Phips (acting).
1757 April 4, The Council.
1757 Aug. 3, Thomas Pownal.
1760 June 3, Thomas Hutchinson (acting).
1760 Aug. 2, Francis Bernard.
1769 Aug. 2, Thomas Hutchinson (acting).
1771 Mar. 14, Thomas Hutchinson.
1774 May 17, Thomas Gage.

UNTIL THE CONSTITUTION

1774 Oct., A Provincial Congress.
1775 July, The Council

UNDER THE CONSTITUTION

Governors elected annually

1780–85, John Hancock.
1785–87, James Bowdoin.
1787 (to Oct. 8, 1793), John Hancock.§
1793 (from Oct. 8), Samuel Adams (acting)¶.
1794–97, Samuel Adams.
1797 (to June 7, 1799), Increase Sumner¶ (Federalist).
1799 (from June 7 to May 20, 1800), Moses Gill (acting),¶ (Federalist).
1800–07, Caleb Strong (Federalist).
1807 (to Dec. 10, 1808), James Sullivan,§ (Dem.-Rep.).
1808 (from Dec. 10), Levi Lincoln (acting),¶ (Dem.-Rep.).
1809–10, Christopher Gore (Federalist).
1810–12, Elbridge Gerry (Democratic-Republican).
1812–16, Caleb Strong (Federalist).
1816–23, John Brooks (Federalist).
1823 (to Feb. 6, 1825), William Eustis,§ (Dem.-Repub.).
1825 (from Feb. 6), Marcus Morton (acting)¶ (Dem.-Repub.).
1825–34, Levi Lincoln (Democrat-Federalist).
1834 (to Mar. 1, 1835), John Davis,|| (Whig).
1835 (from Mar. 1), Samuel T. Armstrong (acting),¶ (Whig)
1836–40, Edward Everett (Whig).
1840–41, Marcus Morton (Democrat).
1841–43, John Davis (Whig).
1843–44, Marcus Morton (Democrat).
1844–51, George N. Briggs (Whig).
1851–53, George S. Boutwell (Democrat and Free-Soil).
1853–54, John H. Clifford (Whig).
1854–55, Emory Washburn (Whig).
1855–58, Henry J. Gardner (American).
1858–61, Nathaniel P. Banks (Republican).
1861–66, John A. Andrew (Republican).
1866–69, Alex. H. Bullock (Republican).
1869–72, William Claflin (Republican).
1872 (to May 1, 1874), Wm. B. Washburn, || (Republican).
1874 (from May 1), Thomas Talbot (acting),¶ (Republican).
1875–76, William Gaston (Democrat).

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* Mr. Hinckley was governor till the union of the colonies in 1692, except during the administration of Sir Edmund Andros.

† A royal patent (3 Nov. 1620) created the Council for New England with definitions of territory. 19 March 1628, the council granted to Sir Henry Rosewell and others the territory afterward confirmed by royal charter to the "Governor and Company of the Mattachusetts Bay in Newe England." This charter which passed the seals 4 March 1629, designated Matthew Cradock as the first governor of the company. On 13 May 1629, Cradock was rechosen by the company, but never came to New England. 20 Oct. 1629, John Winthrop was chosen governor by the company. John Endicott had been sent over as their agent by the grantees under the instrument of 19 March 1628. While Cradock was the nominal governor a commission was sent out, dated 30 April 1629, to Endicott at Salem appointing him "Governor of London's Plantation in the Mattachusetts Bay in Newe England." In the exercise of his duties he was subordinate to the governor in London. Cradock and Endicott were thus chief governor and local governor, respectively, until 20 Oct. 1629, the date of the commission of Winthrop (who had not then arrived); and Winthrop and Endicott were chief and local governors, respectively, until the arrival of Winthrop at Salem, with charter, 12, June 1630; when Endicott's powers were merged in the general authority of Winthrop.

‡ On 9 Nov. 1715, Elizeus Burgess was proclaimed governor, he having been commissioned 17 March 1715, but he never came over to perform his duties, and resigned in April 1716.

§ Died in office.

¶ Lieutenant-governor, acting governor during a vacancy. One of these, Moses Gill, died while so acting, 20 May 1800, and the Commonwealth, for the only time under the constitution, was without a governor or lieutenant-governor. The council, Hon. Thomas Dawes, president, officiated until the 30th of the month, when Caleb Strong was inaugurated governor.

|| Resigned upon election to the Senate of the United States.

1876–79, Alex. H. Rice (Republican).
1879–80, Thomas Talbot (Republican).
1880–83, John D. Long (Republican).
1883–84, Benjamin F. Butler (Democrat and Independent).
1884–87, George D. Robinson (Republican).
1887–90, Oliver Ames (Republican).
1890–91, John Q. A. Brackett (Republican).
1891–94, William E. Russell (Democrat).
1894 (to Mar. 5, 1896), Frederic T. Greenhalge* (Republican).
1896 (from Mar. 5), Roger Wolcott (acting),† (Republican).
1897–1900, Roger Wolcott (Republican).
1900–03, W. Murray Crane (Republican).
1903–05, John L. Bates (Republican).
1905–06, William L. Douglas (Democrat).
1906–09, Curtis Guild, Jr. (Republican).
1909–11, Eben S. Draper (Republican).
1911–14, Eugene N. Foss (Progressive-Democrat).
1914–16, David I. Walsh (Democrat).
1916–18, Samuel W. McCall (Republican).
1919– Calvin Coolidge Republican.

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HORACE G. WADLIN,
Librarian Emeritus, Boston Public Library.

MASSACHUSETTS AGRICULTURAL COLLEGE, at Amherst, Mass., a coeducational institution, chartered in 1863 and opened in 1867 by the State. The college farm is 660 acres in extent, about 175 acres of which are devoted to the campus, 75 to the experiment station, 100 to horticulture and 250 to farming. The work is experimental on the part of the students. The regular course extends over four years, but special courses are given for women desiring to study dairying, market gardening and some other subjects. Winter courses are provided for those unable to take the four years' work. The regular courses lead to the degrees B.S., M.S., M.Agr. and Ph.D. In 1918 the number of instructors was 60 and the students in attendance about 570. The library had about 45,000 volumes; the buildings and grounds were valued at $850,000 and the equipment at $450,000.

MASSACHUSETTS BALLOT. See BALLOT.

MASSACHUSETTS BAY, an arm of the Atlantic indenting the eastern shore of Massachusetts and extending from Plymouth Harbor on the south to Cape Ann on the north, a distance of 42 miles. It is triangular in shape, the north and south shores inclining toward each other until at the entrance to Boston Harbor they are about five miles apart. The depth from the base of the triangle to Boston Harbor is about 21 miles. The northern shore is rocky and irregular, the southern low and sandy. The principal inlets are: on the north coast, Gloucester and Nahant bays and Salem, Marblehead and Lynn harbors, and on the west Boston Harbor. Along the shores are a number of capes and headlands, and off the coast a number of small islands. At the entrance to Boston Harbor there are several islands, on some of which are fortifications. Cape Cod Bay on the southeast is sometimes included in Massachusetts Bay.

MASSACHUSETTS BAY COLONY. See MASSACHUSETTS, *History.*

MASSACHUSETTS HISTORICAL SOCIETY. An association founded at Boston in 1791 and incorporated three years later, for the purpose of collecting and preserving early Americana and documents relative to the early history of the Massachusetts Bay Colony. Since 1792, 70 volumes of 'Collections' and 50 volumes of 'Proceedings' have been printed. It supports a museum of relics and a library containing 60,000 volumes and over 120 brochures, etc. Its prize collections are the Winthrop manuscripts on the early settlement of New England and the Parkman manuscripts dealing with French Canada.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY, The, was founded in 1865, at the close of the Civil War, when the need was beginning to be felt for schools which should train men to deal with the new industrial problems. It was the plan of President Rogers, and of his coworkers, to establish a school which should give a thoroughly practical training in the application of scientific princi-

* Died in office.

† Lieutenant-governor, acting governor during a vacancy. One of these, Moses Gill, died while so acting, 20 May 1800, and the Commonwealth, for the only time under the constitution, was without a governor or lieutenant-governor. The council, Hon. Thomas Dawes, president, officiated until the 30th of the month, when Caleb Strong was inaugurated governor.

ples to practice in the arts, but not primarily training in mere technics, in the narrow sense. Accordingly they planned that each of its courses should embrace enough general studies to impart the elements, at least, of a liberal education; and, above all, they laid down that the most truly practical training, even in an industrial sense, must be grounded in a thorough knowledge of scientific laws.

Founded on these principles, the Institute of Technology began a career of steady development. To-day it is the largest school of its class in the United States, the widest in scope of instruction and in many respects the best equipped. The total number of its students in 1916 was 1,900, the total number of instructors 300. The number of volumes in the library was 100,000. Though 60 per cent of the students come from Massachusetts, among the remainder are found residents of 46 States of the Union, and of 28 foreign countries. In all 48 classes have graduated, aggregating over 6,000 persons. Except in seasons of financial depression, the demand for these graduates is always in excess of the supply.

The undergraduate studies of the school are divided into 15 distinct courses, each of four years' duration, and leading to the degree of bachelor of science. These courses are as follows: Civil engineering, mechanical engineering, mining engineering and metallurgy, electrical engineering, chemical engineering, sanitary engineering, naval architecture and marine engineering, engineering administration, chemistry, electrochemistry, biology and public health, physics, geology, general science and architecture. Between the departments which maintain these several courses there is the closest connection and mutual support. Consequently the instruction is specialized to a degree which would be impossible in a smaller college, with a less numerous staff of instructors. Again, the instructors, though connected in a special sense with one department, are giving instruction, it may be, to students from many others. This mutual helpfulness of the departments is seen first in the fundamental subjects, such as chemistry in the first year and physics in the second, which are given to several courses or to all. It is seen again in the large number of optional lines of work offered. Within most of the regular courses the student is allowed considerable latitude of choice, in the later years of his study, and many thus select that group of studies which is best adapted to the particular branch of his profession for which he is preparing.

For 50 years from its establishment the institute occupied buildings on or near Boylston street in Boston. From the first structure built by President Rogers the number increased to nine, eight of which were devoted to technical instruction. The most interesting aspect of the equipment were the extensive laboratories. Many of them when first instituted represented an attempt to apply the laboratory method in a way up to that time unknown in the history of scientific instruction in this country. The laboratories of physics and of chemistry were the first to offer laboratory instruction in these subjects to students in large classes; and the mining and metallurgical laboratories, the steam laboratory and the laboratory for testing the strength of materials also represent a marked advance over previous methods, either in the subjects taught or in the scale on which the work is done.

Lack of space in which to expand in the congested business and residential section which grew up around it forced the Institute to seek a location adequate to its needs for constantly growing activities. It purchased in 1912 a plot of 50 acres in Cambridge, on the bank of the Charles River Basin facing Boston, and on 14 June 1916 the new Technology was dedicated. Ten acres are devoted to the educational buildings with an available floor space of 730,000 square feet. This easily doubles the area of the old buildings and still leaves room for growth to twice the present size.

The laboratories which were so excellent have been rearranged with greater space and some of them are the most remarkable in the country.

The boiler plant is itself a laboratory, with a capacity of 2,000 horse power, the boilers being of standard type with newest appliances. They are especially adapted to experiment. This powerhouse will care for the heating, lighting and motor force of the great buildings and is built on the lines of a big central station.

Steam is conveyed from the boilers to the steam laboratory in mechanical engineering through a subway seven feet square in section and the supply is carried in 20 and 10-inch pipes. The electrical equipment at the boilers includes three turbines directly connected to generators of 750 kilowatts, 500 kilowatts and 150 kilowatts, respectively, furnishing three phase current at 2,300 volts. In addition there are one 150-kilowatt turbine, two 150-kilowatt motor-generators furnishing direct current at 110 and 220 volts and two 35-kilowatt exciters.

The steam laboratory equipment includes a Curtis turbine of about 75 kilowatts capacity, a 38 horse-power Corliss with dynamometer, a 225 horse-power McEwan tandem compound, a compound and generator of the same make of 250 horse power, and a triple expansion Corliss, especially adapted for experimental purposes.

In the same laboratory there is a Brown engine driving a three-stage compressor which will work up to 2,500 pounds per square inch. There are other compressors and a great many small engines and models of different types.

The hydraulic laboratory is fitted with 700 feet of canals, some of them 40 feet cross section, with reservoirs, weirs, tanks and all kinds of measuring devices. Two pump wells 26 feet deep will serve for the testing of large pumps on a commercial scale. A pump of the capacity of 22,000 gallons a minute lifts water to the second floor above which is discharged through a canal of 25 feet cross section into a penstock for the testing of water wheels. Natural heads up to 35 feet and artificial heads of some hundreds of feet may here be used. The battery of pumps includes a Douglass triplex, a Gould triplex and a Davis triplex, a 150 horse-power turbine with direct connected centrifugal pump, a 100 horse-power Terry turbine, a three-phase Jeansville pump, two duplex pumps each of the capacity of an ordinary steam fire engine, and the great pump which is

driven by an angle compound engine of 325 horse power.

The chemical laboratory is fitted with a central storage for rarer substances, special elevators for quick service within the department, electrical heating devices for the various processes and three systems of ventilation, the regular house system, the hood and a mushroom ventilator applied to every table. The laboratory has its electrical supply independent of the lighting or power systems of the buildings.

The aerodynamical laboratory is equipped with a four-foot blowing tunnel and an aerodynamical balance, a replica of that at Teddington, England. The electrical laboratory is somewhat better than the old Lowell laboratory, but the improvement has been of necessity in details and convenience.

The transmission laboratory is of unusual excellence. The equipment includes a 2,500 nautical mile, artificial cable, corresponding to a regular ocean cable; a 2,500-mile long-distance artificial aerial line corresponding to a long-distance trans-continental telephone line, two artificial power transmission lines of 800 miles and an artificial telephone subterranean line of 35 miles. Besides these items there is a span of power transmission, 150,000-volt capacity. For experiments with this a special laboratory has been built at the foot of one of the towers.

These are some of the new special equipments, but the other laboratories, notably those for testing materials, for industrial chemistry, for biology, etc., find themselves newly placed in improved surroundings with increased facilities and apparatus. The sewage laboratory, being located near one of the great outlets of the principal drainage of the metropolis, will not be moved.

With this unusual laboratory equipment, it has been possible for the Institute to do much of its experimental work on a scale approaching that of industrial operations. The laboratories of mining and metallurgy, for instance, are designed to treat ores in quantities approximating those used in actual practice, and ranging from 500 pounds to 3 tons, and the contributions to the literature of ore-dressing and metallurgy from this laboratory are well known. In the laboratory for testing the strength of materials, again, were conducted the first systematic and extended tests of beams of commercial size.

Throughout all the work of the Institute the aim of instruction is so to adjust the theoretical and experimental work that the acquirement of principles in the classroom shall prepare the student for his laboratory exercises, and that these in turn shall fix methods and results in his memory, and give him capacity for new experimentation. Throughout it is intended to guide the student rather than to instruct him, and, whether in the four-year courses above described or in the graduate courses with which these may be supplemented, he is trained to work with less and less dependence upon his teachers. This training should result in a considerable increase in his powers of ascertaining facts and overcoming difficulties, and so should increase his capacity for research.

MASSACHUSETTS MEDICAL SOCIETY, an association incorporated at Boston, Mass., 1 Nov. 1781, and holding regular sessions from that date to the present. Its charter was signed by John Hancock, first State governor of Massachusetts. Physicians and surgeons, who have made their medical studies in colleges approved by the society and who have been examined by its censors and are of known probity, are eligible to membership. Women were first admitted in 1884. Since 1790 it has regularly issued its 'Medical Communications.' It also issues a 'Pharmacopœia' and 'Publications,' various reports and essays, an annual directory, and, since 1789, a triennial catalogue. The society is a potent force in maintaining a high standard in the medical profession. It has about 3,500 members.

MASSACRE (French, *massacre*, slaughter, probably connected with Latin, *macellum*, a meat-market), the indiscriminate and unnecessary slaughter of human beings, and, in a transferred sense, of animals. In the case of human beings it implies the absence of all forms of law or of sufficient grounds.

MASSACRE OF THE INNOCENTS, the slaughter of the children in and about Bethlehem by the soldiers of Herod, whose superstitious fears caused him to see a rival in the babe of whose birth he was apprised by the wise men (Matthew II, 1–16). The story has been for centuries a favorite subject with artists, especially those of the Flemish and Italian schools. Interise realism is usually injected into the scene and also a wealth of detail. Among the greatest examples are those by Tintoretto in the Scuola di San Rocco, Venice; Reni in the Gallery, of Bologna; Daniele da Volterra in the Uffizi Gallery, Florence; Rubens in the Pinakothek of Munich and Breughel in the Gallery of Vienna.

MASSAGE, a procedure, usually performed by the hands, such as friction, kneading, rolling and percussion of the external tissues of the body, either to relieve pain or to assist a cure, or with some hygienic object in view. A male massagist is known as a masseur, a female as a masseuse. Massage in some crude form has always been used by savages as well as by the civilized. It was mentioned by Homer and Hippocrates, having been one of the luxuries of the ancient Greeks and, among the Romans, was largely used by gladiators, and to make slaves more comely by filling out their tissues. Sometimes it was done by medical practitioners, often by slaves and priests and those appointed to anoint the wrestlers before and after they exercised. Hippocrates says that "rubbing can bind and loosen, can make flesh and cause parts to waste; hard rubbing binds; soft rubbing loosens; much rubbing causes parts to waste; moderate rubbing makes them grow." Manual treatment of the body was long ago practised by the Chinese, and the Japanese, Turks, Egyptians and people of various nationalities have employed it in some form from early times.

Often the use of massage is associated with that of certain active and passive movements known as the Swedish movement-cure (q.v.), established by Pehr Henrik Ling. His system of gymnastics became popular in spite of opposition and of the fact that it was largely a revival of old methods of treat-

ment. In 1873 Mezger, of Amsterdam, and in 1877 S. Weir Mitchell of Philadelphia pushed forward the cause of massage. To-day it is considered by physicians as a branch of medical treatment, useful in certain cases if rightly administered, but capable of doing harm when improperly applied. Unfortunately the laity frequently look upon it as a sole means of relief or cure. Much depends upon the judgment and skill of the masseur, as the special reaction of the individual patient has to be considered and, on the other hand, a skilful operator can accomplish more in a quarter of an hour than an ignorant one can in an hour. The procedures in massage may be placed under four heads: stroking (the *effleurage* of the French), kneading (malaxation), friction and percussion. Stroking is performed over surfaces with the palm of the hand or its radial border, or with the pulps of the fingers, or the sides of the knuckles. Kneading is the grasping of muscles, etc., with both hands or between the thumb and fingers of one hand, and rolling and squeezing them. Friction is a peculiar and forcible circular rubbing. Percussion is the striking or beating of a part, either with the hand or an instrument called a percussor or muscle-beater. A special technique of massaging the face, and particularly the ears and eyes, has had surprisingly gratifying results in preventing deafness and curing certain types of blindness, for instance, where an embolism of a central artery of the retina has been removed by massage. It is claimed that the modern system of massage makes the blood circulate more freely, strengthens muscle-fibres, causes effusions and exudations to be absorbed, improves secretory and excretory action, and invigorates the whole system. It is frequently used with good results to stimulate assimilation and invigorate digestion, to soothe nervous irritability, relieve pain and arouse nerve-force, to equalize the circulation, to remove morbid deposits from around joints, to restore mobility, and for the correction of obstinate constipation and other disordered conditions.

From the point of view of the modern study of unconscious mentality it will be seen that those persons who are the greatest advocates of massage will be the ones who are unconsciously satisfying a desire for stroking, kneading, friction and percussion. Such a method of curing their ills will make an immediate and a strong appeal to their instincts. This presupposes a physical and mental make up, predisposed by early development, to seek and get satisfactions from the skin and muscle sensations derived from manipulation at the hands of another. This mental disposition is in modern times well recognized in psychoanalysis (q.v.), which, however, goes at the treatment in another way. For any diseases which may be helped by massage, there is a cause in the way in which the mind unconsciously regards the pleasures derived from the manipulation of the skin and muscles. If, for instance, the individual is of such a mental constitution that, because of early environment, he has been led to derive more than ordinary pleasure from being stroked, kneaded, rubbed or even beaten (and the history of the development of massage shows that such persons are quite numerous); such an individual will be the more likely to contract diseases of the type which are on record as having been remedied or cured by massage. He will develop those diseases instinctively without knowing the connection between them and the unconscious wish which is the cause of the specific incidence of the symptoms. This practically amounts to saying that the diseases which are enumerated as having been cured by massage are diseases which are virtually selected by the unconscious because of the fact that their treatment will involve the gratification of wishes for just such specific stimulation of the muscular, tendonous and cutaneous end organs. The patient will do well under such a treatment, at least, partly because a source of unconscious gratification closed to him possibly since early childhood has been through massage reopened to him.

MASSAGETÆ, mą-săj'ĕ-tē, in ancient history, a name given to nomadic tribes of northern Asia who dwelt to the east and south of the Caspian Sea. Herodotus says they worshiped and offered horses to the sun, had a community of wives, killed and ate their aged people, lived chiefly on the milk and flesh of their herds and on fish, and fought on foot and on horseback with lance, bow and double-edged axe. They are chiefly mentioned in connection with Persian history. Cyrus the Great perished in war with the Massagetæ, 529 B.C. According to some they belonged to the Mongolian stock, according to others to the Aryan.

MASSASOIT, măs'ą-soit, American Indian chief, sachem of the Wampanoags: b. Massachusetts, 1580; d. 1661. His dominion extended over nearly all the southern part of Massachusetts, from Cape Cod to Narragansett Bay; but his tribe, once estimated at 30,000 in number, had shortly before the landing of the Pilgrims at Plymouth been reduced by a disease, supposed to have been yellow fever, to barely 300. On 22 March 1621, a little more than three months after the founding of Plymouth, he appeared before the infant settlement with 60 of his warriors, armed and painted, for the purpose of forming a friendly league with the white men. Although the tribe were reputed to be cruel and treacherous, the open and friendly greeting of Massasoit so favorably impressed Governor Carver, that after the necessary formalities were concluded, he formed in behalf of the colony a treaty of peace and mutual protection with the Wampanoags, which for 50 years was sacredly kept by both parties. The friendly disposition of Massasoit toward the colonists never relaxed. He lived within the limits of what is now the town of Warren, R. I., near an abundant spring which yet bears his name, where he often entertained wandering pilgrims or administered to their necessities. Roger Williams, while on his way to Providence, was for several weeks his guest at this place. Massasoit was just, humane and honest, never violating his word and constantly endeavoring to imbue his people with a love of peace. In person, Morton says, in his 'Memorial,' he was "a portly man in his best years, grave of countenance, spare of speech." His second son, Pometacom, called by the colonists King Philip, who ultimately became sachem of the Wampanoags, was of a less placable disposition, and allowed the encroachments of the colonists to hurry him into the bloody contest known as King Philip's War. Consult

Baker, Virginia, 'Massasoits' Town Sowams in Pokanoket' (Warren, R. I., 1904).

MASSASSAUGA, măs-ą-sâ'ga, the ground rattlesnake of the central United States. See RATTLESNAKE.

MASSÉNA, André, ăn-drā mă-sā-nā, marshal of France: b. Leven near Nice, France, 6 May 1758; d. 4 April 1817. In 1775 he entered the French army and after 14 years' service left the army and returned to Nice, where he married. During the Revolution he entered a battalion of volunteers, and in 1793 was made general of brigade. In 1794 he took command of the right wing of the French army in Italy, where, at Rivoli and elsewhere, he highly distinguished himself. In 1799 he defeated the Austrian and Russian forces at Zürich, and in 1800, by his defense of Genoa for three months, gave Bonaparte time to strike successfully at Marengo. In 1804 he was created marshal of the empire. In 1805 he received the chief command in Italy, where after the Peace of Presburg he occupied the kingdom of Naples. In 1807 he was given the command of the right wing of the French army in Poland, and soon after received the title of Duke of Rivoli. In 1809 he distinguished himself against the Austrians, and at Esslingen his constancy and firmness saved the French army from total destruction. Napoleon rewarded him with the dignity of Prince of Esslingen. In 1810 he took command of the army in Portugal, and forced Wellington within the lines of Torres Vedras, till want of provisions compelled Masséna to retire. In 1814 he was made a peer by Louis XVIII, and though on the return of the emperor he acknowledged his authority, took no active part in the events of the Hundred Days. Consult his 'Mémoires,' edited by Koch (7 vols., Paris 1848–50); Fitzmaurice, G., 'Massena' (in *Royal United Service Association Journal*, Vol. LVII, London 1913); Gachat, Edouard, 'Histoire militaire de Masséna' (Paris 1908); Toselli, 'Notice biographique sur Masséna' (Nice 1869).

MASSENA, mā-sē'nạ, N. Y., village, in Saint Lawrence County, on the Grasse River, and on the New York Central and Hudson River and the Grand Trunk railroads, about 35 miles northeast of Ogdensburg. It was settled by people from Vermont, about 1802, and was incorporated as a village in 1886. It is situated in a rich agricultural region, in which the chief products are hay, potatoes, dairy products and apples. Massena Springs, just outside the village limits, is one with the village in commercial and industrial interests, and is a famous resort on account of its medicinal springs. Great opportunities for manufacturing are afforded by the plant of the Saint Lawrence River Power Company, which has a capacity of 40,000 horse power, and which can easily be increased. This power has been secured by diverting a small portion of the waters of the Saint Lawrence River through a canal, three miles long, into turbines, which have direct connection with electric generators, and thence into the Grasse River. The canal starts at the head of the Long Sault rapids in the Saint Lawrence, and is 200 feet wide and 18 feet in depth. Owing to the peculiar formation of the country here, the point at the head of the rapids is 45 feet higher than the point where the canal enters the Grasse River, which is a tributary of the Saint Lawrence. The Grasse acts as a tail race, carrying the water back into the Saint Lawrence. Two bridges span the canal. By using the Grasse River and the canal there is now a passage wholly within the United States for steamers around the unnavigable rapids. The power plant at Massena is second only to Niagara as a centralized power supply station. The chief industrial establishments are reduction works, veneering works, mineral filler works, sash and door works, aluminum factory and dairies. There are several churches, banks, a high school and public schools. Massena is the business centre for a population of 60,000. Pop. 2,951.

MASSENET, Jules Emile Frédéric, zhül ā-mēl frā-dā-rēk mās-nā', French composer: b. Montaud, France, 12 May 1842; d. Paris, 13 Aug. 1912. He was the youngest of 21 children; his father, a blacksmith, had served in the engineers under Napoleon. After studying at the Paris Conservatoire under Reber, Laurent, Thomas and Savard, he gained the first prize for pianoforte in 1859, the first for fugue, and the Prix de Rome for his cantata, 'David Rizzio,' in 1863. He had done some traveling in Italy and Germany before he made his *début* in Paris at the Opéra Comique in 1868 with 'La Grand-Tante.' He was appointed professor of composition at the Conservatoire in 1878 and made a member of the Académie des Beaux Arts. Among his earlier works are 'Poème du Souvenir' (1860); 'Poème d'Avril' and 'Suite d'Orchestre' (1868). His first important work was the opera, 'Don César de Bazan' (1872), followed in the same year by 'Les Erinnyes' (a tragedy by Leconte de Lisle) and a sacred drama, 'Marie-Madeleine.' An oratorio, 'Eve,' was performed in 1874; the opera, 'Le Roi de Lahore' in 1877; a sacred legend, 'The Virgin' in 1880; 'Herodiade' (an opera) in Brussels, 1881. 'Manon' appeared in 1883; 'Le Cid' in 1885; 'Esclarmonde,' a romantic opera in 1889; also a large number of popular melodies, pianoforte pieces, and a series of seven 'Suites d'Orchestre,' including 'Scènes Pittoresques,' 'Scènes Alsaciennes,' 'Scènes Hongroises,' 'Scènes Napolitaines' and 'Scènes de Féerie,' as well as two cantatas, 'Narcisse' and 'Biblis.' He also wrote some entr'actes and stage music for Sardou's dramas the 'Crocodile' and 'Theodora.' His opera 'Le Mage' (words by Jean Richepin) and a drame lyrique, adapted from Goethe's 'Werther,' were performed in 1891. 'Thaïs' was first produced at the Paris Opera 16 March 1894, the libretto having been adapted from the novel by Anatole France; a short one-act piece, 'Le Portrait de Manon,' was performed at the Opéra Comique in the same year, and in 1895 he wrote the music for Jules Claretie's 'La Navarraise.' Of his latest works, the opera 'Don Quichotte' was produced in London in May 1912, and his last opera, 'Panurge,' was completed just before his death. His music, always melodious, has been described by critics as being excessively "sugary."

MASSEY, mąs'ī, **Gerald**, English poet: b. Gamble Wharf, near Tring, Hertfordshire, 29 May 1828; d. 29 Oct. 1907. He received but little education, and at eight was employed in a silk factory. Going to London about 1843, he

became an errand boy, and in 1849 editor of *The Spirit of Freedom,* a Radical paper, becoming at the same time associated with Kingsley, Maurice and other Christian Socialists. In 1854 he published 'Ballad of Babe Christabel,' and other poems. The volume attracted the notice of Landor, and the poems issued in succession to it met with no little popularity. Other books of his are 'The Secrêt Drama of Shakspere's Sonnets' (1864–72); 'Havelock's March, and Other Poems' (1861); 'A Tale of Eternity and other Poems' (1869); 'Concerning Spiritualism' (1872); 'A Book of the Beginnings' (1882); 'The Natural Genesis' (1883); 'My Lyrical Life,' a collection of poems (1889). For some years he lectured at home and in the United States and Australia on spiritualism and various social and socialistic subjects.

MASSEY, Hart Almerni, Canadian inventor: b. Haldimand, Northumberland County, Ontario, 1823; d. 1897. He received his education at Watertown, N. Y., and Victoria College, Cobourg, Ontario. He assisted in managing his father's farms and while thus engaged set about improving the agricultural implements then in use. His father established a factory at Newcastle of which Hart became sole owner in 1855. He perfected mowing and reaping machines, the first of their kind in Canada, and introduced improvements in many other farm implements. In 1879 the factory was removed to Toronto. Massey received awards at Paris in 1878, Philadelphia 1876 and at Antwerp in 1885. He was also a noted philanthropist.

MASSICOT. A mineral consisting of monoxide of lead, PbO, containing about 92.8 per cent of that metal and an ore in many mines in Colorado and Idaho.

MASSILLON, Jean Baptiste, zhŏn ba-têst ma-sē-yôn, French preacher: b. Hyères, Provence, 24 June 1663; d. Clermont, 18 Sept. 1742. In 1681 he entered the Congregation of the Oratory; then taught theology at Montbrison and Vienne; went to Paris in 1696 as director of the Seminary of Saint Magloire, and won great favor, even at court, by his eloquent and searching sermons. His funeral orations are particularly famous. In 1718 he was appointed preacher to Louis XV, then only nine years old, and for him composed the 'Petite Carême,' a notable series of sermons. Massillon was elected to the French Academy in 1719; in the same year he retired from Paris to Clermont, where he died of apoplexy. His works were edited in 1828 by Guillon and in 1886 by Blampiguan, whose biographical sketch, 'Massillon d'après des Documents inédits' (Paris 1879), should be consulted. Consult also de Julleville, Louis Petit, 'Histoire de la langue et de la littérature française' (Paris 1898).

MASSILLON, măs'il-ŏn, Ohio, city, in Stark County, on the Tuscarawas River, the Ohio Canal, and on the Wheeling and Lake Erie, the Pennsylvania and the Baltimore and Ohio railroads, about 100 miles in direct line northeast of Columbus and eight miles west of Canton. Massillon was established in 1825, and in 1853 was incorporated as a village; the city charter was granted in 1868. It is situated in the Tuscarawas Valley, noted for its large bituminous coal fields and for its excellent farm lands. In the vicinity of the city are quarries of white sandstone. Some of the industrial establishments are foundries, rolling-mills, machine-shops, bridge works, potteries, fire brick, enameled ware, paper, glass-works, steel tubing, furnaces, flour-mills and creameries. In addition to the manufactures of the city there is a large trade in coal, sand-stone, grain and livestock. The State Hospital and Asylum for the Insane is in Massillon. The city has a number of fine buildings; chief among them are the churches and schools. The government is administered under the charter of 1868, its first charter, and is vested in a mayor, who holds office two years, and a council. The board of education is chosen by popular vote; the boards of health and equalization are elected by the council. Other administrative officials are appointed by the board subject to the approval of the council. Pop. 14,912.

MASSINGBERD, Francis Charles, English clergyman: b. Lincolnshire, 1800; d. 1872. He received his education at Rugby and at Oxford; took orders, and was appointed rector of South Ormsby in 1825. In 1847 he became prebendary of Lincoln Cathedral, and was made chancellor in 1862. He published 'Reasons for a Session of Convocation' (1833); 'Church Reform' (1837); 'The Educational and Missionary Work of the Church in the Eighteenth Century' (1857); 'History of the Leaders of the English Reformation' (4th ed., 1866); 'The Law of the Church and the Law of the State' (1859); 'Lectures on the Prayer-Book' (1864); 'Sermons on Unity, with an Essay on Religious Societies' (1868).

MASSINGER, măs'in-jėr, **Philip,** English dramatist: b. Salisbury, November 1583; d. Southwark, London, March 1640. He studied at Saint Alban Hall, Oxford, went to London in 1606, and soon became a well-known playwright. He collaborated with Nathaniel Field, Thomas Dekker, Cyril Tourneur and Robert Daborne, and regularly with Fletcher in 1613–25. Independently, he wrote 15 plays, including comedies, tragedies and tragi-comedies. They are frequently based closely on Italian and Spanish originals, but show much skilfulness in the development of plot, and a knowledge of the requirements imposed by stage presentation. 'Henry VIII' in its present form was probably written by him with Fletcher. Among the plays wholly by him are 'The Bondman' (1624); 'The Roman Actor' (1629); 'A New Way to Pay Old Debts' (1632); 'The Guardian' (1655). 'A New Way to Pay Old Debts' kept the stage in England to the end of the 19th century. There is an edition of his plays by Cunningham (1867); and of 'Selections' by Symon (1887–89). (See NEW WAY TO PAY OLD DEBTS). Consult Coleridge, Hartley, 'Dramatic Works of Massinger and Ford' (rev. ed., 1883); Symons, A. (ed.), 'Selected Plays' (London 1887–89); 'Transactions of the New Shakespeare Society' (ib. 1880–86); Fleay, 'Biographical History of the English Drama' (London 1891); 'Cambridge History of English Literature' (Vol. VI, Cambridge 1910); Ward, A. W., 'History of English Dramatic Literature to the Death of Queen Anne' (New York 1899).

MASSON, măs'on, **David,** Scottish critic: b. Aberdeen, 2 Dec. 1822; d. Edinburgh, 7 Oct.

1907. He was educated at Marischal College and Edinburgh University; in 1852 was appointed to succeed Clough in the chair of English language and literature at University College, London. He was editor of *Macmillan's Magazine* 1859–68, and was professor of rhetoric and English literature in the University of Edinburgh 1865–95. He is best known for his elaborate and comprehensive study of Milton's life and times (3 vols., 1858–80) — a work valuable alike as a contribution to English history and to the history of English literature. Other works by him are 'British Novelists and their Styles' (1859); 'Recent British Philosophy' (1865); 'Drummond of Hawthornden' (1873); 'The Three Devils — Luther's, Milton's and Goethe's' (1874). He also published the Cambridge edition of Milton's Poems with introductions, notes, and an essay on Milton's English (3 vols., 1877); the Golden Treasury edition (2 vols., 1874); the Cabinet edition (1890) and the Globe edition (1871); 'De Quincey' in 'English Men of Letters' series (1878); an edition of De Quincey's works (14 vols., 1889–91), and 'Edinburgh Sketches and Memories' (1892). In 1893 he was appointed Historiographer-Royal for Scotland. He also wrote 'Carlyle Personally and in his Writings' (1885); 'Edinburgh Sketches and Memories' (1892).

MASSON, Frédéric, frā-dā-rēk mā-sôn, French historian: b. Asnières, 1847. He was librarian in the archives of the Foreign Office, and after the overthrow of the empire became secretary to Prince Napoleon, and was entrusted with the arrangement of the Prince's papers and collections. He is known as the author of nearly 20 volumes in a still incomplete series of works on Napoleon I. His method is anecdotic, and he has based his statements on original documents,— correspondence, account- and note-books, and the like, many of which he himself owns in his large collection of Napoleonic material. Among the titles of his studies are 'La Révolte de Toulon en prairial an III' (1875); 'L'Impératrice' (1877); 'Le Marquis de Grignan' (1881; 3d ed., 1908): 'Les diplomates de la Révolution' (1884); 'Napoléon et les femmes' (21st ed., 1897); 'Napoléon chez lui' (1894); 'Les cavaliers de Napoléon'; 'Napoléon inconnu' (1895); 'Marie Walewska' (1897); 'Joséphine de Beauharnais, 1763–96' (1899); 'Joséphine, impératrice et reine' (1898); 'Joséphine répudiée 1809–14' (1901); 'L'Impératrice Marie-Louise' (1902); 'Napoléon et son fils' (1904); 'Napoléon et sa famille' (9 vols., 1897–1907); 'Le sacre et le couronnement de Napoléon'; 'Autour de Sainte-Hélène' (1908); 'Sur Napoléon' (1909); 'Napoléon à Sainte-Hélène, 1815–21' (1912); 'L'Académie-Française, 1629–1793' (1912); 'Pour l'Empéreur' (1913). In 1903 he was elected to the Académie Française to succeed Gaston Paris.

MASSON, Louis François Rodrigue, Canadian statesman: b. Terrebonne, Quebec, 1833; d. 1903. He received his education at the College of Saint Hyacinthe, province of Quebec, and at Georgetown College, District of Columbia. He was admitted to practise law in 1859. In 1867 Mr. Masson was elected to Parliament as a Conservative member from Terrebonne and continued to hold his seat until 1882. He served as Minister of Militia and Defense in 1878–80; became president of the council in the latter year; and in 1884–87 served as lieutenant-governor of Quebec province. He was called to the Senate in 1882 and a second time in 1892. He published 'Le bourgeois de la compagnie du Nord-Ouest' (1889).

MASSON, Thomas Lansing, (Tom Masson), American editor: b. Essex, Conn., 21 July 1866. He received his education in the New Haven public schools; entered journalism in New York and since 1893 has been literary and managing editor of *Life*. He published 'Yankee Navy' (1899); 'A Corner in Women' (1905); 'The Von Blumers' (1906); 'A Bachelor's Baby and Some Grown-Ups' (1907); 'Best Stories in the World' (1914). He edited 'Humorous Masterpieces of American Literature' (1904); 'In Merry Measure' (1905): 'Humor of Love in Verse and Prose' (1907).

MASSOWAH, mās-sow'ā, or **MASSAWA,** northeast Africa, a seaport and the principal town of the Italian colony of Eritrea, on a small coral island in the Red Sea, at the northern end of Arkeeko Bay, connected with the mainland by a causeway. The town is built of stone, is defended by several forts, and is supplied with water from the neighboring M'Kulu heights. The town is hot and unhealthful, but the M'Kulu hills have a much better climate. A railway 17 miles long connects with Saati inland and continues to Asmara, the capital 60 miles further inland. The chief imports are grain and flour, cotton manufactures, glass-wares, arms, cutlery, spices, wines and spirits; principal exports, rhinoceros-horns, gold, ivory, honey, pearls, gums, ostrich feathers, skins and wax, brought by caravans from the interior. In normal years the total commerce is valued at about $3,750,000. Formerly dependent on Egypt, the town and strip of coast were ceded to Italy in 1885. Pop. about 2,275, including 524 Europeans and about 500 Asiatics.

MASSYS, mās-sīs'. See Matsys, Quentin.

MASTABA, an Arabic word meaning bench, applied by Egyptologists to certain Egyptian tombs which were common under the Memphite dynasties. Remains of hundreds of these tombs still exist. They are in size from 18 by 26 feet to 85 by 172 feet. They are oblong, bench-like structures, with flat roofs of stone slabs. Consult 'Bulletin of the Metropolitan Museum of Art' (Vol. VIII, New York 1913); Erman, Adolph, 'Life in Ancient Egypt' (New York 1894) and Mariette, A. E., 'Les mastabas de l'ancien empire' (Paris 1881–87).

MASTER OF ARTS (M.A. or A.M., *artium magister*), an academical honor conferred by universities of the United States, Great Britain and other countries, upon students after a course of study and a previous examination in the chief branches of a liberal education, particularly philosophy, philology, mathematics, physics and history. The word *magister*, connected with a qualifying phrase, was used among the Romans as a title of honor; but its present meaning must be traced to the time of the establishment of the oldest universities. Regularly organized faculties were not then known as they now exist in the universities. The whole circle of academic activity

was limited to the seven liberal arts (see ART); and they who received public honors on the completion of their course of studies, for their diligence and knowledge, and had already received the degree of *baccalaureus* (bachelor), were called *magistri artium* (masters of the liberal arts). In American and English universities this degree follows that of bachelor. The degree of master of arts is inferior to that of doctor of letters (D.Litt.). In the German universities the title was formerly conferred, but has been superseded by that of doctor of philosophy (Ph.D.), which practically corresponds to the degree of M.A. in other universities. This title is an indispensable preliminary to the attainment of the position of *docent* in the German universities, that is, one who has obtained the right to deliver academical lectures. See CADEMIC DEGREES; COSTUME, ACADEMIC; UNIVERSITY.

MASTER OF BALLANTRAE, băl-ạn-trā, **The,** a novel by Robert Louis Stevenson, published in 1889. It is a Scottish romance of the 18th century, beginning with the Stuart uprising of 1745. It is a sombre tragedy of the enmity of two brothers, of whom the elder, James Durrie the Master, takes the side of the Stuarts, the younger, Henry, that of King George.

MASTER BUILDER, The. The tendency toward symbolism, to be observed in the early romantic works of Ibsen, and occasionally in his dramas of social awakening, becomes dominant in 'The Master Builder' ('Bygmester Solness'), published in 1892 and played the next season. Already in 'The Wild Duck' and 'The Lady from the Sea,' Ibsen had mingled symbolism with naturalism; but only in 'The Master Builder' does the hidden allegory threaten to warp his surface story out of consistency. The piece, which begins with matter-of-fact scenes and situations from middle-class life, ere long develops into a tenuous fable that suggests much more than it presents.

As a drama of ideas 'The Master Builder' emphasizes two notions: the peril of selfish individualism, already shown in 'Rosmersholm' and 'Hedda Gabler'; and the struggle of age against youth. Ibsen, conscious of his advancing years, felt the inevitable passing of power from the older to the younger generation. He felt, also, not only the fear of youth, but its fascination, especially in his innocent affair with Emilie Bardach, a girl of 18 whom he, at the age of 61, had met in the Tyrol during the summer of 1889, and with whom he later corresponded. He has universalized these merely personal sentiments, setting forth the problem of every man who lives long enough to regret what is gone and to strive desperately to hold what is slipping from him. This particular conflict Ibsen associates with the still larger conflict between individualism and altruism.

Solness, the master builder, has achieved success at the expense of his wife and his business associates. He has checked the rise of old Knut Brovik, and refused to young Ragnar Brovik permission to build independently. He has employed the latter's sweetheart and captured her affections only as a ruse by which to retain Ragnar's services. Obsessed, as he admits, with dread of the younger generation, yet thinking himself at last secure from it, he succumbs when the younger generation knocks at his door in the person of Hilda Wangel. Hilda, who had already appeared in a minor rôle in 'The Lady from the Sea,' is a strange and wilful maiden who induces Solness to relax his selfish schemes, and, at the same time, to attempt to mount, as he once was wont, to the top of a lofty tower. He can no longer safely climb to such heights, and yet, inspired by Hilda's faith, he makes the attempt, only to fall. Though he forfeits life, Hilda professes satisfaction, inasmuch as, when he stood at the dizzy summit, she has heard 'harps in the air.' Hilda is the puzzle of the play, an influence for both good and evil, a symbol of youthful aspiration, or perhaps of youth as the enemy of age and of woman as the enemy of man. The charm of the drama lies in its tantalizing hints of concealed significances; its defect lies in its lack of proper correspondence between the human action and the allegory. Much in the later portions of the work is scarcely intelligible as a natural representation of life. 'The Master Builder' has been translated by Edmund Gosse and William Archer (1893). It is discussed in the monographs on Ibsen by Otto Heller (1912), Jennette B. Lee (1907), M. J. Moses (1908), and Henry Rose (1908), and, by P. H. Grummann, in 'Nebraska University Studies' (1910).

FRANK W. CHANDLER.

MASTER OF THE HORSE, an official having charge of the horses, hounds, etc., of a sovereign, as of England. He is there a member of the ministry and the third dignitary of the court. The office is appointive, and he has the use of the royal horses and servants. The office exists to-day in Germany and formerly also in France.

MASTER OF THE ROLLS, a member of the Supreme Court of Judicature in England, who presides with the lords justices in the Court of Appeals, and ranks next to the Lord Chief Justice. He is the keeper of all records of the Court of Chancery and of the rolls of all grants and patents that pass under the Great Seal. By the Supreme Court of Judicature Act of 1873, he was denied the privilege he formerly had of a seat in the House of Commons.

MASTER AND SERVANT. See FAMILY LAW.

MASTER SINGERS. See MEISTERSINGERS.

MASTERS, Edgar Lee, American lawyer and writer: b. Garnett, Kan., 23 Aug. 1868. He studied at Knox College, Illinois, and was admitted to the bar in 1891. His publications include 'A Book of Verses' (1898); 'Maximilian,' a drama in blank verse (1902); 'The New Star Chamber and Other Essays' (1904); 'Blood of the Prophets' (1905); 'Althea,' a play (1907); 'The Trifler,' a play (1908); 'The Spoon River Anthology' (1915); 'The Great Valley' (1916). Mr. Masters writes his poems both in vers libre and in rhymed verse. His 'Spoon River Anthology' is the best known of his works. It is a unique collection of truthful epitaphs on the inhabitants of a middle Western village. It is marked by a biting vigorous satirical style, and is pervaded by a materialism

that shocks and surprises. Despite its obvious limitations, its naïve force has won many readers and much favorable comment. Consult Lowell, Amy, 'Tendencies in Modern American Poetry' (New York 1917).

MASTERWORT, the rustic name of several umbelliferous plants, as those of the genus *Anethum* (see DILL), formerly much cultivated as pot-herbs, and held in great repute as a stomachic, sudorific, diuretic, etc.

MASTIC GUM, or **MASTICHE,** a resinous substance flowing from deep incisions made in the branches of the *Pistachia lentiscus,* a shrub of the terebinth family growing in the countries bordering on the eastern Mediterranean. This tree attains the height of 15 or 20 feet; the leaves are alternate and pinnate; the flowers are small, inconspicuous, disposed in axillary racemes, and are succeeded by an ovoid drupe containing an osseous nut. It forms one of the most important products of Scio, and other Ægean islands, where it has been cultivated from remote antiquity. Heat seems to exercise a great influence on the resinous product. Mastic is consumed as a chewing-gum in vast quantities throughout the Turkish Empire by women of all classes, for the purpose of cleansing the teeth and imparting an agreeable odor to the breath. It is related to myrrh, frankincense, etc., and was formely in repute as a medicine throughout Europe, but at the present time is chiefly useful in the arts as a varnish for maps, drawings, etc. Dentists employ it as a filler for cavities.

MASTICATION, or CHEWING, the thorough subdivision of food in the mouth so that it can be readily acted upon by the gastric juice and other digestive secretions. The tongue, cheeks and lips push the food material between the teeth, and by the lateral and up-and-down motions of the lower jaw it is cut and torn by the incisor, canine and bicuspid teeth and bruised by the molar or grinding teeth. During these actions the food is softened by the saliva (insalivation), which exudes abundantly from the salivary glands by the act of mastication. Typical mastication is seen only in the higher vertebra. "The amphibian bolts its fly, the bird its grain, and the fish its brother without the ceremony of chewing," but in man and the higher animals mastication is necessary for complete and comfortable digestion. Thorough comminution of food by mastication is analogous to the pulverizing process employed by the chemist, but associated with mastication is insalivation, as it is almost impossible to swallow substances which are very dry. Imperfect mastication of food, either by reason of rapid swallowing (bolting), or because of the absence of sound and serviceable teeth, is very frequently the cause of the numerous ailments classified under the term indigestion. Exaggerated mastication which has been so highly recommended by certain persons as almost to constitute a panacea or complete prophylaxis is known to lessen the secretion of gastric juices which is started by sensations of taste, to protract beyond desirable limits the time required for proper gastric digestion, to develop the salivary deposit in a proportion relatively too great when compared with the secretion of the pancreas. It is moreover known that the teeth are likely to wear out too soon, if mastication is carried beyond a reasonable time.

Exaggerated mastication and the fancied advantages accruing from it are an illustration of an indulgence in a form of securing the gratification of an unconscious desire. In infancy a great pleasure is derived merely from mouthing different objects, a pleasure originating in the mode of absorbing the early meals at the mother's breast. It has been discovered by studying the unconscious wishes of mankind that the sexual desire in the adult is a synthesis of different partial desires which in the infant are satisfied in different parts of the body, now here, now there, but which in the adult are assembled in the genital organs or are at least unified under the supremacy of the genitals. But it has been definitely proven that in some individuals this synthesis has never been successfully accomplished. Either the mouth pleasure zones or the anal or the skin or some other zone which gave in infancy a quite absorbing sense of gratification has failed of appropriate subordination, and has persisted into adult life, with some individuals, as a source of extraordinary pleasure. To this class of partially undeveloped minds belong not only the advocates of exaggerated mastication but all other persons who develop any other form of activity as a fad such that they are noticeably peculiar in that respect.

MASTIFF, a breed of dogs of great size, recognized by the large head, the dependent lips, the broad, hanging ears, and by the general muscularity of the form. The mastiff in general disposition is affectionate and gentle, extremely faithful and vigilant. In Rome and in classical ages these dogs were held in high estimation for their strength and courage. The most valued breeds were obtained from Great Britain, where these dogs originated, and were used to guard flocks and herds; and watching has become instinctive with them. Roman officers were appointed to breed them and to transmit them periodically to Rome, where they fought lions, etc., in the arenas of the Roman amphitheatres and were otherwise favorites. The dog now is highly valued, both as a watch-dog, and as a domestic companion. Fawn is the prevalent color, and the weight should be about 165 pounds.

MASTIGOPHORA, a class of Protozoa "in which the flagellate form is prominent although the amœboid and encysted conditions frequently occur." Typical forms are contained in the order *Flagellata* (q.v.).

MASTODON, a genius of fossil proboscidians of the elephant family, whose remains are found in all parts of the world in Tertiary formations from Miocene time onward to the dawn of the present era. Although in size and external appearance the larger mastodons much resembled modern elephants, save that, like the mammoths, the northern species were probably clothed with long hair, they differed widely from other genera of the family in details of structure, especially those affecting dentition. Thus milk-molars were present, and sometimes were persistent; and in their structure the fossil molar teeth are not penetrated by deep partitions of cement, and their crowns are marked by few (3 to 5) transverse ridges,

which are often broken into nipple-like protuberances. This is, in short, the simplest form of tooth-structure in the family, of which the mastodons are the oldest and most primitive type, and nearest to the earlier Dinotheria. The tusks curved upward only slightly; and their length in *Mastodon americanus,* whose remains have been obtained nearly entire from bog-deposits in various parts of the United States, was about nine feet, indicating, as do the measurements of the skeleton, an animal about equal in average height to the modern Indian elephant, but with a rather more bulky body and a flatter forehead. Of this species, which was a belated survival of an ancient Old World type that became extinct in the Pliocene, several good skeletons are preserved in the museums of the United States and Canada, and certain European species are also well known. About 30 different kinds of mastodons have been described from bones found in almost every country in the world. In the Pliocene works of Texas, Nebraska and Idaho are found remains of a proboscidian (*Stegodon*) which was a connecting link between the mastodons and the elephants. What brought this widespread group to an end is not clear. There was no diminution in their food, which consisted of herbage, bark and leaves, as is known from undigested stomach-contents found within the skeletons; and they survived the historic vicissitudes of climates until subsequently the present settled conditions arrived. There is good reason to believe that they lasted in America, at least, until after the advent of mankind, but indisputable evidence of this is lacking. See ELEPHANTS; FOSSIL.

Consult Woodward, 'Vertebrate Palæontology' (1898); Lucas, 'Animals before Man in North America' (1902); Scott, 'Land Mammals of the Western Hemisphere' (New York 1913).

MASTODONSAURUS, a fossil labyrinthodont batrachian found in the Triassic formations of England, Württemberg and India. It is the largest type known, the head having a length of four feet with a body extending to a length of 10 feet.

MASTURBATION. The limited, restricted dictionary definition is self-abuse, that is, genital manipulation by the hands, clothing, bed clothes, by riding, by hard objects and by pressure of things against the genitals, etc. Regarded in its broader aspect of an autoerotic reaction to external reality it covers a multitude of activities not ordinarily realized as masturbatory in nature and is one of the most important topics in the whole realm of psychopathology. Thus broadly defined it is any erogenous satisfaction through any and all modes of gratification carried on for their own pleasure and includes both somatic and psychic masturbation. Not regarded in antiquity as of very vital importance it was brought into prominence and called deleterious principally by Tissot, who wrote early in the 19th century, and is the sponsor of all the lurid literature which has spread over two continents since his time. He taught that masturbation was a very serious weakness and that it led to various forms of illness and insanity, statements for which modern medical science can find no satisfactory proofs. The most modern attitude toward masturbation is that the deleterious effects so often observed in those who practise it come not from any injury to the body but from the guilty feelings of those who abuse themselves and from the tendency it has to remove them from the true relations with their fellows. That is, when the individual satisfies his fantasy sense of potency by any form of masturbation, the personality will regress to more and more infantile levels and the discrepancy between the social value of the autoerotic behavior and the true adult behavior which is called for by the environment will result in some form of mental or bodily illness. The fate of Sodom and Gomorrah revealed its dangers, and the Greeks gave it a poetical conception in the myth of Narcissus (see NARCISSISM), the youth who fell in love with his image in a pool, a story which represents external reality reduced by autoerotism to a mere reflection of self. Thus the forms of physical activity which may be regarded as essentially masturbatory in character are very numerous.

Any act which satisfies the unconscious desires through producing an effect upon the body instead of on the world of external reality is of this nature. And the body has various zones other than the genital in which this self-gratification is practised unconsciously through multifarious forms of activity, the most prominent being the mouth, the intestines and different parts of the skin. The infant naturally puts everything into its mouth, and this habit is continued into adult life by persons who put things into their mouths for other reasons than merely masticating them and swallowing them as food. In fact all objects, not food, that are mouthed serve this purpose, including tobacco, chewing gum, toothpicks, etc., and therefore are subject to the same reproach as any other use of any part of the body through which no change, having a social value, is effected upon external reality. The skin as well as the muscles are used as sources of self-gratification, too, in massage; and such acts as stroking the skin, running fingers through the hair, scratching, tickling, etc., are other examples.

Constipation of the spastic type is the most common form of unconscious masturbation of the anal-erotic zone. Bodily masturbation, conscious as well as unconscious, is paralleled by a form of thinking that may be called mental masturbation, in which the individual, male or female, has acquired the habit, whether or not from practising physical masturbation, of seeking pleasure from his own states of mind. Excessive day-dreaming, reading of light literature and attendance on light drama or moving picture shows, aimless driving about in automobiles and most other forms of solitary or unproductive mental activity may be classed as types of mental masturbation, and when carried beyond a certain degree generally result in a species of mental impotence, in which the individual is unable to carry out any activity to a productive conclusion. The treatment of both mental and physical masturbation is mental. The patient is to be shown through self-analysis just what he is doing, both in its physical and psychical aspects, and that his action is essentially infantile, representing an arrest of development at a very early level, which thus never permits him to act the true adult part in

lite. Various wholesome and truly social activities should be encouraged, and the patient instructed how to enlist his entire libido (q.v.) in them, and the desire for solitary pleasure will gradually disappear.

SMITH ELY JELLIFFE.

MASUDI (Abu-l Hasan 'Ali ibn Husain ibn 'Ali ul-Mas'udi), Arabic geographer and historian: b. Bagdad, near the close of the 9th century; d. Fostat, about 956 A.D. Receiving a good education he set out to study the history, manner of life, customs, etc., of every land at first hand. This quest took him to Persia and Kerman, in 915 to Istakhr, to Multan and Mansura in 916. From there he journeyed to Cambay, Saimur and Ceylon, to Madagascar and back via Oman. He also visited the shores of the Caspian; journeyed to Tiberias in Palestine. He visited Antioch in 943 and Damascus in 945. The last decade of his life was spent in Egypt and Syria. Of the Mo'tazilite sect, he was free from bigotry, studied Christianity and Judaism and was well versed in the history of the principal nations of both Orient and Occident. He wrote a universal history in 30 volumes, entitled 'Kitab akhbar uz-Zaman,' followed by a supplement in 'Kitab ul-Ausat,' a chronology of general history. The two works were combined by the author in 'Muruj udh-Dhahab wa ma'adin ul-Jawahir' ('Meadows of Gold and Mines of Precious Stones') in 947. Editions have been published at Bulak (1866) and at Cairo (1886). The original with French translation by C. B. de Maynard and P. de Courteille has appeared (9 vols., Paris 1861–77; Vol. I, in English by A. Sprenger, London 1841). An enlarged edition of this work finished by Masudi in 956 appears to be now lost. Another work, written in 956, is 'Kitab ut-Tanbih wal Ishraf' ('Book of Indication and Revision') is a summary with corrections of his other writings. It was edited by M. J. de Goeje (Leyden 1894) and there is a French translation by Carra de Vaux (Paris 1896) and a partial translation in De Saaj's memoir to Meynard's edition of 'Muruj.' Consult Brockelmann, Karl, 'Geschichte der arabischen Literatur' (Vol. I, Weimar 1899); Field, C., 'Tales of the Caliphs' (1909); Nicholson, R. A., 'Literary History of the Arabs' (Cambridge 1907).

MASULIPATAM, or **BANDAR,** British India, capital of the district of Kistna, Madras, situated at the mouth of the Kistna, on the Bay of Bengal. It was the earliest English settlement on the Coromandel coast, an agency being established there in 1611. Subsequently the town was held for some years by the French; it was taken by storm by Forde in 1759. A storm-wave inundated the town in 1864, and about 30,000 lives were lost. Weaving, bleaching and cloth printing are the principal industries, but do not enjoy their former importance. Noble College is the chief educational institution. The port is merely a roadstead in which vessels anchor five miles off shore. Masulipatam is reached by a branch of the Southern Mahratta Railway from Bezwada. Pop. 42,100.

MASURENLAND, East Prussia, a lake-dotted district around Lyck, Lötzen, Sensburg, Ortelsburg, Neidenburg, Oletzka, Osterode, Rössel and Allanstein. It is marked by rolling hills, divided by hundreds of lakes, many of which are joined together by long narrow channels. Mauer and Spirding are the most important and largest of these bodies of water. A few years ago the imperial government entered into negotiations with a company which proposed to drain the greater part of the Masuren region and sell the reclaimed land to settlers. Negotiations were proceeding apace when von Hindenburg heard of the project. For many years he had studied the region and was convinced that the lakes and surrounding marshes were the equivalent of several army corps in defending Germany against an invasion by Russia. He opposed the drainage scheme, went to Berlin, interviewed the emperor and as a result the project was abandoned. The view of Hindenburg was vindicated in 1914–15 after the battle of Tannenberg, when the aged general partly encircled the Russians with the lakes in their rear. Whole regiments were lost in the quagmires, and great quantities of stores fell to the Germans. See WAR, EUROPEAN — EASTERN FRONT.

MA'T, the Egyptian goddess of justice and truth. She was usually represented as wearing an ostrich feather on her head, with eyes bandaged as a sign of her impartiality. Judges and kings were at all periods her professed worshippers. The father of the goddess was Rê, the sun god. Her Greek compeer was Themis. Consult Budge, A. E. T. W., 'The Gods of the Egyptians' (Vol. I, London 1904) and Wiedemann, Alfred, 'Religion of the Ancient Egyptians' (New York 1897).

MATABELELAND, mă-tă-bē'lē-länd, South Africa, the southeastern district of Rhodesia (q.v.) between the Limpopo and Zambesi, north of the Transvaal. In 1889 it came under the administration of the British South Africa Company, against whom the natives unsuccessfully rebelled in 1893 and 1896. The Matabeli are a war-like Kaffir race, who migrated from Natal in 1827 under their chief, Umsilikatse. The country is traversed by ranges of hills,—the Matoppo Hills being the chief—is watered by numerous streams, has good pasture and is believed to be rich in gold. It is now being rapidly settled and developed. Buluwayo is the capital. Other towns are Girelo and Selukwe. There are 11,000 whites and 249,000 natives. The Cape to Cairo Railroad passes through Buluwayo, which is 1,360 miles distant from Cape Town. Consult Baden-Powell, 'The Matabele Campaign' (2d ed., London 1901); Montague, 'Interior of Central Africa' (ib. 1886); Norris, 'Matabeleland' (ib. 1895); Oates, Frank, 'Matabele Land and the Victoria Falls' (ib. 1881); Wills and Collingridge, 'The Downfall of Lobengula' (ib. 1894).

MATACHIN, măt ą chēn', or **MATACHINE,** "the dance of fools," a former well-known comic dance performed by maskers in mock-military guise. It was common in France and Italy. The dance itself was merely a display of tumbling or acrobatic feats.

MATACO, a South American Indian stock, including several tribes, whose habitat is in the Vermejo River Valley in the Gran Chaco, in northern Argentina. They are of medium size with wavy hair and subsist by hunting, fishing and cattle-raising. Their dress is made

of skins and they dwell in huts of brush. Consult 'Anales de la Sociedad Científica Argentina' (Buenos Aires 1904); Brinton, D. G., 'Linguistic Cartography of the Chaco Region' (Philadelphia 1898); Schuller, 'Sobre el orígen de los charruás' (Santiago 1906).

MATADOR, in Spanish bullfights the man appointed to administer the fatal stroke to the bull. See BULL-FIGHT.

MATAGALPA, mä-tä-gäl'pä, Nicaragua, town, capital of the department of Matagalpa, north of the central part of Nicaragua. It is situated in a fertile agricultural region, in which the chief products are tobacco, coffee and sugar. The lack of railroads has been a hindrance to the growth of the town, but plans are formed for connecting it with the Pacific and with Managua, the capital, and other cities. The inhabitants are mostly Indians. Pop. about 15,000.

MATAMATA, a large fresh-water turtle (*Chelys fimbriata*) of the Amazon and Orinoco valleys, which has a flat, weak, but heavily embossed shell, and lies in concealment among the weeds. Its neck is very long, the head is small, the nose is extended into a flat tubular proboscis and the jaws are so weak and soft that it is evident nothing can be forcibly seized with them. Hence it is believed that the frogs, small fishes and the like, upon which this turtle feeds, are sucked into the throat rather than bitten. To facilitate its concealment against both enemies and expected prey, the head and neck of this remarkable creature are covered with an outgrowth of fleshy fringes, which float about in the water, like tangled weeds, hiding its identity most effectively. Consult Gadow, Hans, 'Amphibia and Reptiles' (London 1901).

MATAMOROS, Mariano, mä-rē-ä'nō mä-tä-mō'rōs, Mexican patriot: b. Mexico, about 1770; d. Valladolid, 3 Feb. 1814. He first appears in 1810 as substitute priest of the parish in Jantelolco, a village south of Mexico City. In 1811 he identified himself with the revolt of Hidalgo (q.v.), and became the principal commander under Morelos (q.v.). He attained the rank of lieutenant-general on 19 April 1813. On 14 Oct. 1813 he gained the victory of San Agustin del Palmar, and on 5 Jan. 1814 was captured at the defeat of Puruarán. He was executed in Valladolid market-place. The town of Matamoros, on the United States frontier, was named in memory of this sterling patriot.

MATAMOROS, Mexico, a frontier town and river port opposite Brownsville, Tex., in Tamaulipas, on the right bank of the Rio Grande del Norte, about 30 miles above its mouth in the Gulf of Mexico. It consists chiefly of brick houses; around the public square stand the church, town-house, custom-house and a number of elegant private dwellings. A considerable trade is carried on with the United States; horses, hides, wool, cotton-seeds, etc., are exported, and manufactured goods imported. In normal years its commerce is valued at about $4,000,000. During the Mexican War in 1846 the town was occupied by American troops under General Taylor, on 18 May. Pop. 10,000.

MATANE, ma'tán, Canada, town in Rimouski County, province of Quebec, on the Canada and Gulf Terminal and the Intercolonial railroads. Steamers ply between it and Montreal and Gaspé. The town has large saw mills and extensive lumber interests. Pop. 2,056.

MATANUSKA RIVER, an affluent of Knik Arm, Cook Inlet, Alaska. The valley of this stream has extensive coal deposits which have been the subject of Federal legislation in recent years. See ALASKA, and consult Martin, 'Matanuska Coal Field' (in 'United States Geological Survey, Bulletin 239'), and 'Railway Routes in Alaska' (in 'Document 1346, House of Representatives, 62d Congress, 3d Session').

MATANZAS, mä-tän'zas (Sp. mä-tän'thäs). Cuba, a seaport city on the north coast, capital of Matanzas province, 52 miles by rail east of Havana. It is situated on Matanzas Bay, one of the largest, safest and most convenient harbors of the western hemisphere. The city is well-built with wide, regular and paved streets, handsome plazas and public buildings and good railway communications. The caves of Bellamar and Yumuri Valley, in the neighborhood, are two popular natural resorts. Matanzas ranks in importance next to Havana in the export of sugar, molasses, rum and coffee, the exports of sugar alone averaging annually about $15,000,000. It has sugar mills, distilleries, oil refineries, tanneries, shoe factories, machine shops, etc. It was founded in 1693, and suffered from piractical incursions during the first century of its existence. The city was bombarded by the United States warships during the Spanish-American War in 1898, the only casualty, widely telegraphed, being an injury to a "Matanzas mule," which made the animal famous. Pop. 39,000.

MATAPAN, mä-tä-pän', **Cape.** See CAPE MATAPAN.

MATAS, Rudolph, American surgeon: b. Bonne Carre, near New Orleans, La., 12 Sept. 1860. He was educated at Barcelona, Spain; Paris, France; Brownville, Tex.; Soule's College, New Orleans; Saint John's Literary Institute, Matamoros, Mex., and at Tulane University. Since his graduation he has practised in New Orleans, where since 1895 he has specialized in surgery. In the latter year also he was appointed to the chair of surgery at Tulane University. Dr. Matas is senior surgeon of Touro Infirmary and senior visiting surgeon at the Charity Hospital. In 1917 he was commissioned major in the medical reserve corps of the United States army, was president of the American Surgical Association in 1910; of the Southern Surgical and Gynecological Association in 1911, and vice-president of the American Society of Clinical Surgery in 1908–10 and of the American College of Surgeons in 1913. From 1883 to 1895 he edited the New Orleans *Medical and Surgical Journal.* He is the author of many treatises and monographs on surgical subjects and a frequent contributor to medical journals and textbooks.

MATCH INDUSTRY. It was nearly 800 years after the discovery of phosphorus by an Arab, named Bechel, that it was found possible to obtain a light in a short time by the friction of phosphorus and sulphur. This discovery was

made and first applied commercially in the latter part of the 17th century by Godfrey Haukwitz, of London, and, although the feasibility of producing a substance which, with a little rubbing, would ignite, was at once demonstrated, and, although it was proven that such a substance would be of immense commercial value, yet it was nearly a century and a quarter before a friction match was invented and successfully put on the market. The method employed by Haukwitz consisted of rubbing small particles of phosphorus between folds of brown paper and the flame produced lighted a sulphur match, but, as the phosphorus at that time was costly and considered dangerous, the match was not a success.

Among the earliest inventions was the "phosphorus bottle," containing a piece of phosphorus, stirred about by a hot wire, in order to coat the bottle with oxide of phosphorus, and when a light was desired a sulphur match was thrust into the bottle and thus ignited. This "phosphorus bottle" was followed in 1805 by the "oxymuriate match," the invention of Chancel, of Paris. These matches were, however, considered dangerous, and in 1809 a mixture of phosphorus and magnesia was invented by Derepos, which was designed to do away with the danger attendant upon the use of the others.

One of the first forms of matches used was the brimstone match, and this consisted of small strips of resinous or very dry pine wood dipped in melted sulphur and lighted by means of a spark dropped from a flint and steel. This brimstone match was in almost universal use, despite the fact of later inventions, till the first part of the 19th century, and even as late as 1825, but with the general awakening at that time in all branches of industry the same progress was manifest in the invention of matches and of more ingenious machinery for making them. The first invention along this line came in shape of the "Instantaneous-Light Boxes," called the Eupyrions and Prometheans, the invention of a Mr. Jones of London. These light boxes retailed at a very high price and were made of small sticks of dry wood tipped with a mixture of chlorate of potash and sulphur, which, when dipped into sulphuric acid, ignited. These were dangerous because of the acid and because of the liability of harm from the explosion when ignited and the cost was prohibitive to general use. This was followed in 1827 by the Congreve match, invented by a chemist, named Walker, of Stockton-on-Tees. This match was similar to the "Instantaneous-Light Box," but the mixture on the end consisted of gum, chlorate of potash and sulphide of antimony, placed over a coat of sulphur. They were drawn between a fold of sandpaper to ignite them. These sold for a shilling per box, containing 84 matches. They did not become generally used because they did not readily ignite and the fumes created by the burning substances were very offensive.

In 1833 the lucifer friction match, the progenitor of the modern match, was put on the market and this differed materially from the "Instantaneous-Light Box," at first being tipped substantially the same as the Congreve, but later having phosphorus as one of the ingredients of the mixture. The manufacture of these phosphorus matches was commenced on a large scale in 1833 at Vienna, by an Austrian named Treschel, and gradually several factories began to produce matches of various kinds, Austria and southern Germany taking the lead in production. Red or amorphous phosphorus was discovered by Prof. Anton von Schrötter, a German, in 1845, and was used as early as 1855 by Lundstrom, of Jönköping, the first manufacturer of the well-known "safety-match." In these matches the phosphorus is omitted from the composition placed on the tip of the match, but is placed on the side of the box, and thus the match will only ignite when rubbed on the box. On 24 Oct. 1836, Alonzo D. Phillips, of Springfield, Mass., was granted the first patent on friction matches given in the United States.

In the early days the greater portion of the matches made came from the poorer sections of London and various other large cities, and of course were made for the greater part in cellars and badly ventilated places. This often led to disease called necrosis of the bone, caused by the handling of phosphorus, or by inhaling its fumes. This disease in time became so prevalent among the match-makers that, for fear it would be carried along and spread by the manufactured articles itself, the local governments took a hand in the matter and forced the owners of these "cellars" to provide well-aired, ventilated and well-lighted places for the employees. With the improvement in surroundings also came improvements in the methods of manufacture. Until about 1842 the splints or sticks of wood used were whittled out by hand entirely, but in that year a machine for cutting these splints was invented by Reuben Partridge and this practically revolutionized the trade by reducing the number of employees, producing a much better article in a shorter time and materially reducing the cost of manufacture. This will be seen to be true when it is stated that in the year 1856 there were but 40,000,000 matches made in England, while at the present time one factory alone in this country has facilities for making 100,000,000 matches per day.

The general size of the match now made is from one and seven-eighths to two and a half inches in length, the wood used being pine, thoroughly dried. After discarding the knots and cross-grained parts, the blocks of pine are placed in the automatic feeder of a machine, run through and cut into splints. These splints are cut by knives or dies so arranged that when cut they are separated about a quarter of an inch and then set into cast-iron plates made into an endless chain by link attachments. The speed of this machine may be set according to the needs, from 175 to 250 revolutions per minute and as it cuts 44 matches at each revolution it is very rapid. After the splints have been cut the endless chain attachment carries them from the cutting end of the machine over a block which heats the heads to a temperature great enough to melt paraffine. After they have passed over the heating block the chain carries them along to the receptacle containing the paraffine and composition forming the head. The reason why the match is heated before reaching these composition rollers is that the paraffine may not be chilled by coming into contact with a cold substance and also the match takes more readily to the composition when heated. Having passed the composition rollers and received its head, the match is cooled off

by blasts of cold dry air for an hour and a half and then pushed off the iron plates or endless chain by a mechanical device into small paper or strawboard boxes. These boxes, containing 65 to 500 matches, are automatically fed into the machine and, after having received their quota of matches, are placed on a rotary table, covered and packed into cases. The greater portion of the material used for the composition placed on the head of the match is imported from foreign countries, due probably to the fact that the articles may be more cheaply produced in foreign countries owing to the cheapness of labor.

With the advances made in the methods of manufacturing matches, of necessity the machinery for making the boxes made a corresponding advance, and has practically kept astride of the times. The majority of the inventions made in the strawboard box machinery were made by Mr. E. B. Beecher, of Westville, Conn., while the improvement of the match-making machinery is mainly due to McClintock Young, of Frederick, Md., J. P. Wright, of New Haven, Conn.; Charles Palmer, John W. Denmead and Joseph Baughman, of Akron, Ohio. The operation of the machinery for making the paper and strawboard boxes used in the match business is as follows: After having placed a roll of strawboard, cut to the proper width and lined either with pink or white paper, in the machine, the board is scored for the corners; it is then glued by an automatic device, folded into an endless tube and passed on through the printing presses in that form and are printed on three sides. After being cut into proper sizes, the boxes are passed further along by the machine to a compartment where they receive a coat of sand on the fourth side, thus making a striking or rubbing surface for the ignition of the match. Thus the cover is completed and the box proper is made in substantially the same way, with the exception of the printing and sanding, and the entire box is turned out from the machine at the rate of over 400 per minute.

The immense saving accruing from these improved devices has steadily reduced the cost of manufacture, and the rapidity with which the entire operation of match-making is conducted has tended to reduce the number of companies operating factories, and also to greatly reduce the number of people employed in the industry.

The effect of the automatic boxmakers on the number of people employed has been wonderful. To have constructed the 2,000,000 boxes now made in a single day, 40 years ago, would have taken the combined labor of 1,500 persons, whereas it now takes but 75 people to operate the machines which turn out the same work in a more satisfactory manner. Books or cards of matches are formed by another class of automatic machines, that cut the wood into combs, which are dipped, dried, packed and marketed in that form, for convenient carrying in the pocket. In the number of establishments making matches the effect of the modern machinery has made itself apparent also.

The statistics of the industry follows:

	1880	1890	1905	1909	1914
Number of establishments	37	27	23	26	20
Capital	$2,714,850	$1,941,092	$5,334,035	$11,953,000	$11,736,000
Wage earners	2,219	1,696	3,185	3,631	3,800
Wages	$535,910	$473,556	$1,100,890	$1,389,719	$1,758,000
Cost of materials used	$3,298,562	$935,008	$3,284,855	$4,598,878	$5,202,000
Value of product	$4,668,446	$2,193,638	$5,646,741	$11,353,138	$12,556,000

The importation is about 10 per cent of the manufacture, adding that much to the United States consumption. The match-making industry has assumed considerable proportions in Norway, Sweden, Germany, France and the United States; in France the industry being a government monopoly, in the United States being largely controlled by one corporation, the Diamond Match Company, which is credited with over 75 per cent of the production, having four very large factories. It is also an interesting fact for sociologists that in this industry the wage earners receive less than one-fourth of the value of the goods they produce, first deducting the cost of materials.

MATE, an officer in the mercantile marine who acts as the assistant of the captain or master. There are four grades — first, second, third and fourth mate. The junior mate has usually the superintendence of the stowing of the vessel. The law recognizes only two classes of persons in charge of a trading vessel — the master and the mariners, the mates being included in the latter. In the navy, the term mate is now limited to the assistants of certain warrant officers, as boatswain's mate, gunner's mate, etc. See PETTY OFFICER.

MATÉ (Port., *herva matté;* Sp., *yerba maté*), or **PARAGUAY TEA,** a beverage in general use in Brazil and also in general favor throughout South America, prepared from the leaves and shoots of *Ilex Paraguayensis.* The chief maté-producing state is that of Paraná, from which are exported many million pounds of this Brazilian "tea" annually. The maté tree (in appearance not unlike a small evergreen oak or ilex with a heavy and fleshy leaf) grows freely in the forest, entirely without cultivation; and in the forest the leaves undergo, as soon as they are plucked, a first preparation which both diminishes their weight before transportation and also keeps them from fermenting. They are dried at a fire, and then packed in sacks which are sent to the mills at Curitiba which reduce the leaves to powder and separate the various qualities. Aromatic properties retained in the dried and powdered leaves are extracted by means of infusion. As a stimulating and wholesome beverage habitually used throughout a large part — especially the southern part of the continent, maté might well be called, not by the competing names Brazilian or Paraguayan, but more simply the South American tea. The exportation of maté

is to Paraná what the exportation of coffee is to the neighbor state of São Paulo: the basis, practically, of economic achievement. In a recent year maté was exported to the extent of 75,885 metric tons.

MATEHUALA, mä-tä-wä'lä, Mexico, a southern town of the state of Nuevo Léon, with silver-melting establishments and important silver mines in the vicinity. Gold and copper are also found nearby in paying quantities. The city is well built, has several plazas and wide streets. Pop. 12,000.

MATERIA MEDICA (Lat. "medical matter"), that division or branch of medical science which treats of drugs, their origin, classification as natural products, preparation, purification, action on the animal economy, together with the mode of administering them for the relief and cure of disease. The action of the various agents in the materia medica upon the human family has been ascertained by experience, sometimes by experiment, especially by administering various drugs to some of the lower order of animals such as dogs, cats, rabbits, guinea pigs, rats and mice. Perhaps the best general classification of medicine is as stimulants, sedatives, narcotics, emetics, alteratives, tonics, anæsthetics, antispasmodics, astringents, spinants, cathartics, diaphoretics, diuretics, blennorrhetics, emmenagogues, hæmatinics, antacids, irritants, demulcents, coloring agents and anthelmintics. This classification is based upon the direct effect of the different drugs upon the tissues of the human economy under the various headlings which drugs may be conveniently grouped under four general sections, namely: 1. Those which have a special action on the brain, spinal cord and the general nervous system. 2. Those which have a special action on the secretions. 3. Those which change the blood. 4. Those which act locally, when applied to the surface of the body. Section (1) includes antispasmodics, anæsthetics, astringents, narcotics, tonics, sedatives, spinants and stimulants. Section (2) includes the emetics, emmenagogues, blennorrhetics, diuretics, diaphoretics and cathartics. Section (3) includes alteratives, antacids and hæmatinics. Section (4) includes anthelmintics, coloring agents, demulcents and irritants. See PHARMACOPŒIA; THERAPEUTICS.

MATERIALISM, the philosophical theory that everything which exists is ultimately material in nature, or that whatever is real can be derived and explained in accordance with the laws of material phenomena. This, of course, carries with it a denial of the reality of any finite or infinite spirit as an immaterial substance and a repudiation of all forms of idealism, which uses thought or intelligence as a principle of explanation. Materialism, however, may be more or less explicit and may maintain either absolutely, or with various modifications, the primary and all-embracing character of matter. Thorough-going materialism asserts that nothing exists but physical bodies and physical processes. What are called immaterial substances and processes it either declares to be unreal, or explains away as ultimately not different in nature from physical substances and processes. Moreover, for materialism of this consistent and uncompromising type, matter is dead and moved only by mechanical forces. It has no "psychic side," and the laws which it obeys are the expressions of a blind physical necessity. This extreme view is perhaps no longer maintained by any philosophical thinker of reputation, but in various modified forms it still exists as a tendency to subordinate mental phenomena to physical processes. The more important of these modifications and limitations may be brought under the following heads. (1) The subordination of mental phenomena, while still acknowledging more or less explicitly their distinctive character, to physical, and especially to physiological processes as their determining causes. This position does not usually avoid any of the practical consequences of materialism, and always tends, when thought out, to revert to the strict ontological form of the theory. For it is an easy transition from the view that physical processes are able to cause mental modifications to the opinion that the mind is not fundamentally different in character from the matter which affects it. (2) The view that matter is not a dead lump or mass that moves only when acted upon by some external body, as the older theories assumed, but that every particle of matter—every atom, or it may be every cell—is "conjoined with a soul," or has a "psychical side," or "contains a certain element of mind-stuff." By thus introducing an element which is different in character and in mode of operation from matter, this theory seems to differentiate itself in principle from materialism. Nevertheless, it is usually assumed tacitly by representatives of this modern Hylozoism that within the atom or cell the material side is the primary and determining element, while the physical is secondary and subordinate. Moreover, the whole mode of conception usually remains at the mechanical stage, since the immaterial element never comes to its rights as an ideal principle, but is conceived as a mere moving force or instinct, and also since it is assumed that the complex mental life can be built up by the composition of psychic elements just as a material body is constituted by the combination of its parts. (3) The position of energism. Recently an attempt has been made to find in energy an ultimate reality in terms of which both mental and material phenomena may be expressed. It cannot be maintained, however, that the conception of energy has yet been clearly defined, nor is everyone prepared to accept the assurance of Professor Ostwald, the chief representative of the theory, that energy is the concrete reality which we directly experience. To many it may appear to be merely an abstract conception built out of the data of experience. Apart from this difficulty, however, energism does not avoid materialism merely by dematerializing its fundamental principle. In Professor Ostwald's hands, it appears to remain essentially materialistic; since the conceptions employed and the laws which the transformations of energy obey are those of physical science.

If the period of the Middle Ages is excepted, when philosophical thought was determined mainly by theological conceptions, materialism may be said to have held a place throughout the whole history of philosophy. We have already noticed some of the forms in which this

mode of thought continues to appear at the present day, and may now refer briefly to its more important historical representatives. The systems of the early Greek philosophers who found the fundamental principle of things in some physical substance, such as water, air or fire, cannot properly be classed as materialism. For as yet there was no opposition between the material and the spiritual. Neither the conception of matter as lifeless and unintelligent substance, nor of mind as an immaterial directing principle, had yet been formed. Atomism, as developed by Democritus of Abdera, is the first thoroughgoing system of materialism. Democritus taught that the soul, like everything else, is an aggregate composed of atoms. The soul-atoms differ from all the others in being the finest, smoothest and most mobile. When they are in isolation, they are insensible, but from their union sensation arises. From sensation all the other processes of the mental life originate. The same conclusions were maintained by the Epicureans, who adopted without any essential modification the theory of atomism. In spite of the statement of the Stoics that whatever exists is corporeal, their system cannot properly be described as materialism. For the human soul and God, the all-embracing Logos of which the human reason is a spark of emanation, though constantly described in materialistic terms, yet function ideally as rational directing forces.

Materialism was revived in modern times by Gassendi (1592–1655) (q.v.) under the form of atomism. Modern materialism was, however, first worked out by Thomas Hobbes (q.v.), who based it upon the mechanical conceptions which in his day were being made the basis of all physical science. He did not deny the existence of immaterial things — God, angels, pure spirits — but shrewdly contented himself with showing that only that which is composed of parts, that is, bodies, can be the object of thought and so be known. All real phenomena must therefore be explained in accordance with the mechanical theory and in terms of the movement of bodies. Under the influence of the developing physical sciences and especially of the dominant conception of mechanism, materialistic tendencies played an important part in the thought of the 18th century. David Hartley (1704–57) and Joseph Priestley (1733–1804) (q.v.) definitely subordinated the mental life to the bodily processes, though the latter attempts to reconcile his materialism with Christianity and even to support it by appealing to the Bible. It is in France, however, in the systems of La Mettrie (1709–51), Baron d'Holbach (1723–89), and Cabanis (1757–1808) (q.v.) that we find in this century representatives of materialism who do not hesitate to draw the most extreme consequences of their doctrine, to deny the existence of God and to reduce man to a mere piece of physical mechanism. Again, in the middle of the 19th century, a revival of materialism occurred in Germany which had an important popular influence. The most important names connected with this movement are Carl Vogt, J. Moleschott, H. Czolbe and Louis Büchner (whose book, 'Kraft und Stoff'—'Force and Matter'— has been called the Bible of German materialism, and has passed through numerous editions in its English translation). The general adoption of the evolutionary point of view was in the beginning at least favorable to materialism. The philosophical problem seemed to be to derive from some primitive form of matter all the various modes of existence in accordance with the established laws of physical evolution. To this task Herbert Spencer (q.v.) devoted his life with a result that is variously estimated in different quarters. It can at least be said that at present thinkers are more inclined than formerly to question the adequacy of physical science to furnish a complete and final explanation of the nature of the evolutionary process.

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MATHEMATICAL INDUCTION. See INDUCTION, MATHEMATICAL.

MATHEMATICAL SIGNS AND SYMBOLS, *in mathematics,* a symbol employed to denote an operation to be performed, to show the nature of a result of some previous operation, or to indicate the sense in which an indicated quantity is to be considered. The present mathematical symbolism is due to the labors of many men — men having different habits of thought, men living in different ages, men speaking different languages. A physicist will employ sine *a* and sine *b* to calculate the angle of refraction of light. Now certainly there is neither sine *a* nor sine *b* in reality; yet there are most certainly *relations of reality* which are accurately described in these expressions, sine *a* and sine *b*. Such is the function of all signs, symbols or characters. Whenever the eye can be brought to the aid of one's imaging faculty, a success in grasping a thought may often be gained which would otherwise be a failure. This is in particular true in mathematics where the subject matter, while objective, is non-sensible. In this way signs, and symbols, stand for the emphatic presentation of mathematical ideas, often very subtle even when symbolized; and with such signs these ideas become, as it were, easy to exhibit, that is, in thought; and the relations of these ideas become thinkable, even very often to the whole complex train of ideas in which they occur.

One very important property for symbolism to possess is that it should be concise, so as to be visible at a glance of the eye and to be rapidly written. A sign should if possible always represent the same object, and the same object should always be represented by the same sign. If a new sign be advisable, permanently or even temporarily, it should carry with it always some mark of distinction from that which is already in use, unless it be a demonstrable extension of the latter (De Morgan). The importance of notation is recognized when it is remembered, for example, how great an advance toward the solution of the famous problem of the three bodies was made when special attention was given to it, and a special symbolism chosen for it. And the invention of the symbol $\equiv$ by Gauss affords

a fine example of the advantage which may be derived from a good notation; it, without exaggeration, marks an epoch in the development of the science of arithmetic. The language of analysis, says Laplace, being in itself a powerful instrument of discoveries, its notations, especially when they are necessarily and happily conceived, are so many germs of new calculi.

Nowadays we have a symbol for each mathematical operation. Sometimes, even a choice of symbols. And most of the letters of the English alphabet are now engaged for special mathematical purposes. Thus:

a signifies sometimes a finite quantity; at other times a known number, the side of a triangle opposite A; also an intercept on the axis of x, and, finally, altitude.

b like a signifies a known number, and also a side of a triangle, the one opposite B; it also stands for base; and lastly, for an intercept on the axis of y.

c signifies constant.

e signifies the base of the Napierian logarithms.

A considerable inroad has been made, also, into the Greek alphabet:

γ signifies the inclination of the axis of x;

π stands for the ratio 3.14159;

ϵ is used for sum of tens similarly obtained; and

σ indicates the standard deviation in the theory of measurements.

Some examples of reading notation may be given:

$a+b$, $a-b$, $a+b$, $a \times b$, and $a \sim b$ are read a plus b, a minus b, a divided by b, a multiplied by b, and the difference between a and b.

Further:—$a > b$, $a < b$, $a = b$, $a \sim b$, and $a \equiv b$ are to be read a greater than b, a less than b, a approximating to b, and (Gauss' symbol) a identical with b.

Our present day symbols of operation, + (plus) and — (minus), appear to be among the oldest. Both are found in Widmann's arithmetic published in 1489, at Leipzig. In the time of Widmann, the symbols ( ), ×, ÷, > and < were unknown. Rudolff had already begun to employ the radical sign. But = had not yet appeared. In those days almost everything was expressed by words, or mere abbreviations. Yet even then both cubic and biquadratic equations had already been solved; the methods even were published. Oughtred used the term "separatrix" in sense of a mark between the integral and fractional parts of a number written decimally. His symbol for a separatrix was L. Stevens had already used a figure a circle over or under each decimal place to indicate its order. And of the various separatrixes that have been employed by mathematicians, four are still employed: (a) A *vertical line* is still employed to separate cents from dollars in ledgers, etc. Such a separatrix appears already in 1613, employed in a work by Richard Witt. Napier also used a vertical line for the same purpose in his 'Rabdologia,' in 1617; (b) a *period*, still employed as a separatrix, is so used as early as 1612 in the trigonometry of Pitiscus, a German. Napier, in his 'Rabdologia,' speaks of so employing a period or comma. The period has always been the prevailing form of the decimal point in America; (c) the Greek colon, a dot above the line, was advocated as a separatrix by no one less than Sir Isaac Newton. His desire was to prevent it from being confounded with a period used as a mark of punctuation. This form of the decimal point is now commonly used in England; (d) Pitiscus is the author of an Italian work on trigonometry. He, in this work, published in 1608, uses a comma as a decimal point. Kepler, in 1616, seems to have introduced this mark, the comma, into Germany for the same purpose. Briggs likewise used a comma in his logarithmic tables, in 1624; and several other early English writers generally employed the comma as a decimal point. But to-day the comma is customary form of the decimal point, *not* in England, but in countries upon the mainland of the European continent.

For example: $1\frac{50}{100}$ would in America be written decimally as 1.50; in England as 1·50; and in Germany, France and in Italy as 1,50.

Symbols in general may now be mentioned: The sign of cancellation is simply drawn across the factors cancelled, like the one drawn across the zeros above. These with the ordinary Arabic and Roman numerals and the abbreviations for the names of things, like £, s, d, $, ¢, °, ′, ″, constitute the main symbols of ordinary arithmetic. In algebra there are four kinds of symbols: symbols of quantity, of operation, of relation and of abbreviation. Known quantities are represented by the first letters of the alphabet; or by the final letters with one or more accents, as x', y'', z'''. Besides letters of Greek and even of the Hebrew alphabet are employed. Thus M stands for "modulus" of any system of logarithms. π has been spoken of.

Of symbols of operation, multiplication may be indicated by placing a point between the factors when both are expressed by letters, as $a \,.\, b$. In a series multiplication between factors expressed even by numbers, may be expressed by a point between such factors. When $\sim$ is used between two quantities, it denotes difference, but not which quantity is to be subtracted from the other. Division has been sometimes indicated thus: $a \mid b$. The radical sign, $\sqrt{\ }$, when placed over a quantity indicates that its root is to be taken. Thus $\sqrt{a}$ denotes the square root of a. In the same manner $\sqrt[3]{a}$ and $\sqrt[n]{a}$ are read the *cube root* and the *n*th *root* of a, respectively. Here ^{3} and n give the *index* of the radical. A vinculum, ———, a bar |, brackets [ ], and parentheses ( ) all indicate that the quantities enclosed by them are to be regarded together as wholes. In algebra, Σ denotes that the algebraic sum of several quantities of the same nature as that to which the sign is prefixed is to be taken. The letter f, F and ϕ, written before any quantity, or quantities, separated by commas, as

$$F(x),\ f(x,y),\ \phi(x,y,z),\ \text{et cetera,}$$

denote quantities depending upon the quantities, or the quantity, within the parenthesis, without designating the nature of the relation. The signs of proportion, : :: :, when placed between quantities show them to be in proportion. R, r and ρ, and other symbols, denote *radii* of circles. L, l and λ may denote latitude. The leading letters of the Greek alphabet are also

sometimes used to denote known angles; and the final letters of the same alphabet to denote unknown angles. And when several quantities of the same kind are involved in an investigation, they may be designated by the same letter differently accented; thus: a' a'' a'''; a_1 a_2 and a_3. An older usage of o denotes an infinitely small quantity; and only sometimes absolute zero. Clearer thinking has impelled moderns to use ι (iota) or i for an infinitesimal, and to denote by o, *absolute zero*, and that only. The symbol ∞, first employed by Wallis in the 17th century, has long been used both for a *variable increasing without limit* and for *absolute infinity*. Taylor, in 1898, introduced the symbol $\aleph_0$, a contraction of $\frac{\infty}{0}$ for an *infinite*, the reciprocal of an infinitesimal. The sign $\therefore$ denotes *then* or *therefore;* and the sign $\because$, *since* or *because*. The $y = f(x)$ is a general sign, indicating that there is a *general relation* between y and x — that is, y and x are so connected that x cannot change without y changing at the same time. The symbol $F(x, y, z,) = 0$ implies that there is a general relation between x, y and z, without specifying the relation. The symbols *sin, cos, tan, co-tan, sec, co-sec, ver-sin, co-ver-sin,* are abbreviations used, respectively, for the words "sine," "cosine," "tangent," "cotangent," "secant," "co-secant," "versed-sine" and "co-versed-sine." When the arc is supposed, as in trigonometry, to depend for its value upon any of the trigonometric lines, the function is called the inverse trigonometric function. The following symbols are used to denote this kind of a relation:

$$sin—^1y,\ cos—^1y,\ tan—^1y,\ cot—^1y,\ sec—^1y,\ co\text{-}sec—^1y,\ ver\text{-}sin—^1y,\ co\text{-}ver\text{-}sin—^1y.$$

These stand, respectively, for the arc upon the sine, cosine, tangent, co-tangent, secant, co-secant, versed-sine and co-versed-sine,— is y. The principle of notation has been extended to all inverse functions; thus:

$$\log {}^1y,\ d—^1\ (x\,d\,x),\ \text{etc.}$$

These stand, respectively, for the quantity whose logarithm is y^1, and the quantity whose differential is $x\ d\ x$, etc. The differential of a function, or independent variable, is denoted by d, thus:

$$d\ (y^2) = 2ydy.$$

If we suppose the form of a function to vary, the symbol employed to denote the variable is δ, thus:

$$\delta u,\ \delta y,\ \delta x.$$

If both the form of the function and the independent variable of the function vary together, the resulting variation is denoted by the symbol D, thus:

$$D\ f\ (x,y)\ \ldots\ .$$

The differential is the difference between two consecutive states of the quantity differentiated. If it is desired to represent the difference between two states of a function which are not consecutive, the symbol Δ is employed. Successive finite differences are represented by the symbols:

$$\Delta u,\ \Delta^2 u,\ \Delta^3 u,\ \Delta^4 u,\ \text{etc.}$$

We have already spoken of Σ as used in algebra, where it denotes an algebraical sum. Its use in the calculus is principally restricted to the denotation of the *sum of the finite differences of a function*. The symbol $\int$ denotes an integration to be performed; while the symbol $\int_a^b$ is used to denote *a definite integral* taken between the limits a and b. The symbol $\Gamma(x+1)$ stands for the integral $\int e^{-x} x^{x-1} dx$. The vector sign is U. $\Gamma\beta$, in quaternions, should be read tensor of B.

In the foregoing list nearly all the symbols, commonly employed by American mathematicians, have been enumerated; as well as some used abroad.

MATHEMATICAL SOCIETIES AND JOURNALS. The oldest of the sciences, mathematics has always been cultivated and fostered, often with a degree of preferment over the later branches of the tree of knowledge, by the universities, the great academies and the other scientific bodies of a general scope throughout the civilized world. The indispensable condition for satisfactory progress, facility of publication, has been provided for mathematicians in a very large degree by the 'Transactions' and 'Proceedings' of learned societies representing a wide scientific field. The specialist will usually prefer the mathematical journals proper, which indeed send out in a steady flow the finest product of the mathematical genius of the age. Theirs is the post of honor; it lies with them, by critical encouragement or repression, to maintain the standard of excellence of a great profession.

But there remains another set of functions, which to-day are more and more efficiently performed by the mathematical societies. These include in their membership nearly every mathematician of standing in the four quarters of the globe. They provide a professional forum for the discussion of mathematical questions and of mathematical interests, and furnish the powerful stimulus of association and solidarity. Their activities cover a wide range, including the presentation and publication of papers and memoirs, the encouragement of bibliographic and encyclopedic undertakings, the organization of international congresses, special conferences and lectures, the exercise of a beneficial advisory influence on the mathematical curricula and equipment of the schools and universities, the diffusion of a better understanding of the science in the educated world, the formation of libraries, collections of models, etc., and the promotion of agreeable social and personal relations among mathematicians.

The following list comprises the principal mathematical societies of the world, arranged in chronological order of foundation, with mention of their several publications:

1690. Mathematische Gesellschaft in Hamburg. Mitteilungen, 1881—.
1778. Wiskundig Genootschap te Amsterdam. Wiskundige Opgaven mit de Oplossingen, 1855—; Nieuw Archief voor Wiskunde, 1875—; Revue Semestrielle des Publications Mathématiques, 1892—.
1866. London Mathematical Society, Proceedings, 1865—.
1866. Moscow Mathematical Society, Transactions, 1869—.
1873. Société Mathématique de France, Bulletin, 1873—.
1883. Mathematical Society of Edinburgh, Proceedings, 1884—.
1884. Circolo Matematico di Palermo, Rendiconti, 1884—.
1886. Mathematical Society of Charkow, Bulletin, 1879.
1888. American Mathematical Society, Bulletin, 1891—; Transactions, 1900—; Mathematical Papers of the Chicago Congress, 1896; Colloquium Lectures on Mathematics, 1905, 1910, 1913, 1914.
1890. Deutsche Mathematiker-Vereinigung, Jahresbericht, 1892—.

1895. British Mathematical Association, Mathematical Gazette, 1894—.
1909. Indian Mathematical Society, Journal, 1909—.
1909. Calcutta Mathematical Society, Bulletin, 1909—.
1911. Sociedad Matematica Española, Revista, 1911—.
1915. Mathematical Association of America, American Mathematical Monthly, 1894—.

A history of the Hamburg Society, prepared in connection with the celebration in 1890 of its 200th anniversary, may be found in volume II of the 'Mitteilungen.'

The 'Wiskundig Genootschap' renders an especially valuable service in the mathematical world by the publication of the 'Revue Semestrielle,' a condensed abstract of all the mathematical papers published in the various journals, constantly brought up to within a few months of the current date. The value to a productive mathematician of this great labor-saving device is quite inestimable.

The first president of the London Mathematical Society was the illustrious De Morgan, and the roll of members has included the names of Cayley, Sylvester, H. J. S. Smith, Clifford, Salmon, Stokes, Kelvin and most of the other eminent British mathematicians of the time. The secretary's office was efficiently filled for the long period of 34 years (1867–1901) by the late Robert Tucker. The 'Proceedings,' which is the leading British mathematical journal, has recently been enlarged in size. The membership of the society is about 300.

The Société Mathématique de France has about the same membership. The meetings are held twice a month at the Sorbonne. The president of the society for 1916 is M. Fouché, the secretaries are MM. Lévy and Montel. The council includes Appell, Borel, Jordan, Painlevé and Picard. The 'Bulletin' is issued quarterly.

The Deutsche Mathematiker-Vereinigung represents in full measure the fruitfulness and vigor of German mathematics. Its organization had been foreshadowed for many years, but was actually brought about in 1890 by the initiative of members of the mathematical-astronomical section of the older Society of German Natural Scientists and Physicians, in affiliation with which the Vereinigung still continues to hold its annual meetings. The appearance of the 'Jahresbericht,' whose volumes were originally issued in parts of book form, signalized the beginning of a series of invaluable reports on various branches of mathematics, beginning with the celebrated report by W. F. Meyer on 'The Present Status of the Theory of Invariants' (Vol. I, 1892). These reports and other undertakings of a bibliographical, critical and statistical character ultimately led to the plan of the 'Encyclopedia of Mathematics,' now in course of publication by Teubner, under the auspices of academies of science of Munich, Vienna and Göttingen. The Vereinigung has also played an active part in the organization of the international congresses of mathematicians, notably those of Zürich (1897) and Heidelberg (1904). It has interested itself effectively in the questions concerning the teaching of mathematics in the schools, universities and technical institutes, the training of teachers, the correlation of instruction in pure and applied mathematics and other matters of reorganization and progress in education, some of which are phases of an international reform movement. A history of the Vereinigung by the former secretary and present editor of the 'Jahresbericht,' Prof. A. Gutzmer of Jena, was issued on the occasion of the Heidelberg congress. The society has at present about 650 members. Meetings are held annually. It recently received from B. G. Teubner the gift of a complete set of his extensive mathematical publications as the nucleus of a library. The 'Jahresbericht,' now published monthly with occasional double bimonthly numbers, contains, beside the earlier reports mentioned above and a record of the society's activities, addresses, biographies and necrologies, original papers, criticisms, discussions and reviews and notes on current events. More extensive papers are published as separate volumes.

The American Mathematical Society was originally organized as the New York Mathematical Society in 1888 and was reorganized under its present national title in 1894. Sylvester's work at Baltimore (1877–84) and the influence of young mathematicians returning from study in Germany had produced a tidal movement of which the society has since its early days been the forefront and exemplar. Its membership, now about 740, includes practically every mathematician in the United States, and a considerable number of foreign representatives. The 'Bulletin,' published since 1891 in monthly numbers from October to July, is of the type later adopted by the 'Jahresbericht,' but contains also the official reports of the frequent meetings of the society, with abstracts of the papers presented and a complete bibliography of recent mathematical publications. Another special feature of the 'Bulletin' is the extensive «Notes» on current events in the mathematical world. The 'Transactions,' founded in 1900, is the official organ of the society for the publication of the more important papers read before it. The library of the society, now including 5,000 bound volumes, is deposited in the Columbia University Library.

Regular meetings are held four times a year in New York and twice a year in Chicago. Officers are elected at the annual meeting in December. A summer meeting is also held each year at some specially chosen place. At intervals of two or three years the summer meetings are reinforced by colloquia, or courses of lectures by specialists on recent advances in their particular lines of work. The rapid growth of mathematical interest in the Central and Western sections of the country have led to the organization of a Chicago Section (1898), a San Francisco Section (1902) and a Southwestern Section (1907). The sections meet once or twice each year.

The presidents of the society have been J. H. Van Amringe, 1888–90; Emory McClintock, 1890–94; G. W. Hill, 1894–96; Simon Newcomb, 1896–98; R. S. Woodward, 1898–1900; E. H. Moore, 1900–02; Thomas S. Fiske, 1902–04; W. F. Osgood, 1904–06; Henry S. White, 1906–08; Maxime Bocher, 1908–10; H. B. Fine, 1910–12; E. B. Van Vleck, 1912–14; E. W. Brown, 1914–16; L. E. Dickson, 1916–. The secretaries have been Thomas S. Fiske, 1888–95, and F. N. Cole, 1895–. The business of the society is transacted by a council composed of the officers, ex-presidents, editorial committee of the

'Transactions,' secretary of the Chicago Section and 12 other members elected for a term of three years.

While the society is more especially devoted to the advancement of the higher branches of mathematics, it exerts a considerable influence both directly and through its members on the teaching of the subject in the schools and universities. The report of a committee of the society on college entrance requirements in mathematics has been adopted by the College Entrance Examination Board. A report on the requirements for the master's degree, presented to the Chicago Section, has been favorably recognized by several of the Western universities. The society has also contributed materially to bring about the organization of associations of teachers of mathematics throughout the country, a movement especially stimulated by Professor Moore's presidential address in 1902.

Historical notices of the society may be found in the presidential addresses of Dr. McClintock ('Bulletin,' January 1895) and Professor Fiske (ib., February 1905). Other notices are scattered through the secretary's reports. The society, which has increased its membership by 50 per cent in the last 12 years, serves to-day to bring together in a harmonious whole all the mathematical activities of America. It is a centre not only of scientific activity but also of professional good feeling and agreeable personal relations.

The British Mathematical Association, formerly known as the Association for the Improvement of Geometrical Teaching, is devoted to improved instruction in elementary mathematics.

The Mathematical Association of America, organized in 1915 to represent the field of collegiate mathematics, has now over 1,100 members. It has adopted as its official organ the *American Mathematical Monthly*. The presidents of the Association have been E. R. Hedrick, 1915–17, and Florian Cajori, 1917–). The secretary-treasurer is W. D. Cairns. Meetings are held twice a year, usually in connection with those of the American Mathematical Society. Nine local societies have thus far been organized, holding meetings usually twice a year.

The international congresses of mathematicians have been mentioned above. While these are individually but temporary gatherings, they had come, before the war, to be an established institution of great and permanent value. Their sequence of time and place is: Paris, 1889; Chicago, 1893; Zürich, 1897; Paris, 1900; Heidelberg, 1904; Rome, 1908; Cambridge, 1912.

The exchanges of the American Mathematical Society include about 140 journals which regularly publish mathematical papers of appreciable value. In the notices appended to his collection of abbreviated titles of journals ('Jahresbericht der Deutschen Mathematiker-Vereinigung,' Vol. XII, 1903, pp. 426–444) Felix Müller sets the grand total ever published of all journals of a fairly mathematical complexion at about 1,200, of which over 600 now survive. More than 300 journals are cited in the references of the early numbers of the 'Encyclopedia of Mathematics.' The 'Revue Semestrielle' reports the contents of some 250 journals; the 'Fortschritte' list is about 170.

The oldest journals in Müller's list are the 'Philosophical Transactions' and the 'Journal des Savants,' both dating from the year 1665. Following these are the publications of the academies of Paris (1666) and Bologna (1690). From the 18th century there still survive, beside the journals of the academies (Berlin 1700; Petersburg, 1724; Göttingen, 1751; and others), also the 'Memorie di Matematica e di Fisica' (1782) of the Società Italiana, the 'Bulletin' (1789) of the Société Philomatique of Paris, and the 'Journal de l'Ecole Polytechnique' (1794). Among the extinct journals may be mentioned the 'Ladies' Diary' (1704), 'Gentlemen's Diary' (1741), these two uniting in the 'Lady's and Gentlemens Diary' (1841–71); the 'Cambridge Mathematical Journal' (1839–45), the forerunner of 'Sylvester's Quarterly Journal'; Gergonne's 'Annales de Mathématique' (1810–31); Tortolini's 'Annali' (1850–57), superseded by the present 'Annali di Mathematica'; and the various journals (1786–1825) of Hindenburg, Breithaupt, Bessel, Kretschmar. In America the ephemeral existences are chronicled of the 'Mathematical Correspondent' (1804–06), 'Adrain's Analyst' (1808) and 'Mathematical Diary' (1825–32), 'Mathematical Companion' (1828–31), 'Mathematical Miscellany' (1836–39), 'Cambridge Miscellany of Mathematics, Physics and Astronomy' (1842–43), 'Runkle's Mathematical Monthly' (1858–61). The publication of the 'Analyst' (1874–83) marked a substantial advance. Martin's 'Mathematical Visitor' (1877) and 'Mathematical Magazine' (1882), the 'Mathematical Magazine' (1882) and 'Mathematical Messenger' (1884) are extinct.

The following list gives the date of foundation, the title and the present place of publication of the strictly mathematical journals now in existence and not already cited in connection with the list of mathematical societies above:

1826. 'Crelle's Journal für die reine und angewandte Mathematik,' Berlin.
1836. 'Liouville's Journal de Mathématiques pures et appliquées,' Paris.
1842. 'Nouvelles Annales de Mathématiques.'
1855. 'Quarterly Journal of Pure and Applied Mathematics,' London.
1858. 'Annali di Matematica pure ed applicata,' Milan.
1863. 'Giornale di Matematiche di Battaglini,' Naples.
1868. 'Mathematische Annalen,' Leipsic.
1870. 'Bulletin des Sciences Mathématiques,' Paris.
1871. 'Jahrbuch über die Fortschritte der Mathematik,' Berlin.
1872. 'Messenger of Mathematics,' London.
1878. 'American Journal of Mathematics,' Baltimore.
1881. 'Mathesis,' Ghent.
1882. 'Acta Mathematica,' Stockholm.
1884. 'Annals of Mathematics,' Cambridge, Mass.
1884. 'Bibliotheca Mathematica,' Leipsic.
1886. 'Periodico di Mathematica' (Supplemento 1896), Leghorn.
1890. 'Nyt Tidsskrift for Matematik,' Copenhagen.
1891. 'Revue de Mathématiques speciales,' Paris.
1894. 'American Mathematical Monthly,' Springfield, Mo.
1894. 'L'Intermédiaire des Mathématiciens,' Paris.
1895. 'Gazeta Matematica,' Bucharest.
1896. 'Il Pitagora,' Palermo.
1896. 'Revue de Mathématiques,' Turin.
1897. 'Wiadomosci Matematyczne,' Warsaw.
1898. 'Formulaire Mathématique,' Turin.
1898. 'L'Education Mathématique,' Paris.
1898. 'Bolletino di Bibliografia e Storia delle Scienze Matematiche,' Turin.
1899. 'L'Enseignment Mathématique,' Paris.
1900. 'Bolletino di Matematica,' Bologna.
1906. Sphinx Oedipe, Nancy.
1909. Mathematics Teacher, Syracuse, N. Y.
1912. Tohokn Mathematical Journal, Sondai, Japan.

MATHEMATICAL SOCIETY, The American. See AMERICAN MATHEMATICAL SOCIETY, THE.

MATHEMATICAL SOCIETY, The London, an association formed in the English capital in 1865 by a number of English professors of mathematics for the promotion of that science. It was incorporated in 1894. Since its formation it has regularly published 'Proceedings' and papers on mathematical subjects. It has an excellent library of scientific works. The Society meets monthly from November to June, the anniversary meeting being held in November.

MATHEMATICS. The science of mathematics — what shall it be said to be? A question much discussed by philosophers and mathematicians in the course of more than 2,000 years, and especially with deepened interest and insight in our own times. Many have been the answers, but none has approved itself as final. All of them, by nature belonging to the «literature of knowledge,» fall under its law and tend to «perish by supersession.» Naturally enough conception of the science has had to grow with the growth of the science itself. For it must not be inferred that mathematics, because it is so old, is dead. Old it is indeed, classic already in Euclid's day, being surpassed in point of antiquity by but one of the fine arts and by none of the «natural» sciences; but it is not only the oldest science, it is also as new as any, living and flourishing to-day as never before, advancing in a thousand directions by leaps and bounds. It is not merely as a giant tree throwing out and aloft myriad branching arms in the upper regions of clearer light and plunging deeper and deeper root in the darker soil beneath. Rather is it an immense forest of such oaks, which, however, literally grow into each other, so that, by the junction and intercrescence of limb with limb and root with root and trunk with trunk, the manifold wood becomes a single living organic growing whole. A vast complex of interpenetrating theories — such the science now actually is, but it is more wondrous still potentially, component theories continuing more and more to grow and multiply beyond all imagination and beyond the compass of any single genius, however gifted. What is this thing so marvelously vital? What does it undertake? What is its motive? How is it related to other modes and interests of the human spirit?

One of the oldest, at the same time the most familiar, of the definitions conceived mathematics to be the science of magnitude, where magnitude, including multitude as a special kind, signified whatever was «capable of increase and decrease and measurement.» Capability of measurement was the essential thing. That was a most natural definition of the science, for magnitude is a singularly fundamental notion, not only inviting but demanding consideration at every stage and turn of life. The necessity of finding out how many and how much was the mother of counting and measurement and mathematics, first from necessity and then from joy, so busied itself with these things that they came to seem its whole employment. But now the ordinary notion of measurement as the repeated application of a constant finite unit has been so refined and generalized, on the one hand through the creation of the so-called irrational and imaginary numbers (see ALGEBRA; COMPLEX VARIABLE), and on the other by use of a scale, as in non-Euclidean geometry (see NON-EUCLIDEAN GEOMETRY; ANALYTICAL METRICS), where the unit appears to suffer lawful change from step to step of its application, that to retain the old words and call mathematics the science of measurement seems quite inept as no longer telling either what the science has actually become or what its spirit is bent upon.

Moreover, the most striking measurements, as of the volume of a planet, the valency of atoms, the velocity of light or the distance of star from star, are not done by *direct* repeated application of a unit. They are all accomplished by indirection. Perception of this fact it was which led to the famous definition by the philosopher and mathematician, Auguste Comte, that mathematics is the «science of *indirect* measurement.» Here doubtless we are in presence of a finer insight and a larger view, but the thought is not yet either wide enough or deep enough.

For it is obvious that there is much admittedly mathematical activity that is not in the least concerned with measurement whether direct or indirect. In projective geometry (which see), for example, it was observed that *metric* considerations were either absent or subordinate. The fact, to take a simplest example, that the two points determine a line uniquely, or that the intersection of a sphere and a plane is a circle, is not a metric fact: it is not a fact about size or quantity or magnitude. In this field it was *position* rather than size that to some seemed the centre of interest, and so it was proposed to call mathematics the science of magnitude or measurement and position.

Even as thus expanded, the definition yet excludes many a mathematical realm of vast, nay, infinite extent. Consider, for example, that immense class of things known as *operations*. These are limitless alike in number and in kind. Now it so happens that there are systems of operations such that any two operations of a given system, if thought as following one another, together thus produce the same effect as some other single operation of the system. For an illustration, think of all possible straight motions in space. The operation of going from a point A to a point B, followed by the operation of going from B to a point C, is equivalent to the single operation of going from A to C. Thus the system of such operations is a closed system: combination of any two operations yields a third not without but within the system. Now the theory of such closed systems — called groups (see GROUPS) of operations — is a mathematical theory of colossal proportions. But it is obvious that an abstract operation, though a very real thing, is neither a position nor a magnitude.

This way of trying to come at an adequate conception of mathematics, viz., by attempting to characterize in succession its distinct domains, or varieties of content, or modes of activity, is not likely to prove successful. For it demands an exhaustive enumeration, not only of the fields now occupied by the science, but also of those destined to be conquered by

it in the future, and such an achievement would require a prevision that none may claim.

Fortunately there are other paths of approach that seem more promising. Every one has observed that mathematics, whatever it may be, possesses a certain mark, namely, a degree of certainty not found elsewhere. So it is, proverbially, the exact science par excellence. Exact, no doubt, but in what sense? To this an excellent answer is found in a definition of the science given about one generation ago by a distinguished American mathematician, Prof. Benjamin Pierce: mathematics is the science which draws necessary conclusions — a formulation of like significance with the fine *mot* by Prof. William Benjamin Smith, to wit: mathematics is the universal art apodictic. These statements, though neither of them may be entirely adequate, are, both of them, telling approximations, at once foreshadowing and neatly summarizing for popular use the conclusion reached by the creators of modern logic (see SYMBOLIC LOGIC), that mathematics is included in, and, in a profound sense, may be said to be identical with, symbolic logic. Observe that the emphasis falls on the equality of being "necessary," or logically *correct*. Naught is said about the conclusions being true. That is another matter for subsequent consideration.

But why are mathematical conclusions correct? Is it that the mathematician has a reasoning faculty essentially different in kind from that of other men? By no means. What, then, is the secret? Reflect that conclusion implies premises, that premises involve terms, that terms stand for ideas or concepts or notions, and that these latter are the ultimate material with which the spiritual architect, called the reason, designs and builds. Here, then, one may expect to find light. The apodictic quality of mathematical thought, the correctness of its conclusions, are due, not to any special mode of ratiocination, but to the character of the concepts with which it deals. What is that distinctive characteristic? The answer is: precision, sharpness, completeness of determination. But how comes the mathematician by such completeness? There is no mysterious trick involved: some ideas admit of such precision and completeness of determination, others do not; and the mathematician is one who deals with those that do. Law, says Blackstone, is a rule of action prescribed by the supreme power of a state commanding what is right and prohibiting what is wrong. But what are a state, and supreme power, and right and wrong? If all such terms admitted of complete determination as do, for example, such terms as triangle and circle, then the science of law would be a branch of pure mathematics. And such, too, to take another example, would be psychology, were consciousness, mind, perception, imagination, and all kindred terms, as completely determinable as the notion sphere. It will be asked, does not the lawyer sometimes arrive at correct conclusions? It may be admitted that he does sometimes, and so, too, of the psychologist or historian or sociologist. When this happens, however, when these students arrive, it is not meant at truth, for that may be by happy chance or by intuition, but when, strictly speaking, they arrive at conclusions that are correct, at conclusions, i.e., that follow logically from completely ascertained data or premises, then that is because they have been for the time acting in all literalness the part of mathematician. That is not to aggrandize the science of mathematics. Rather is it for credit to all serious thinking that, in any considerable garment of thought, one may find here and there, rarely enough sometimes, a mathetic fiber, woven in some perhaps exceptional moment of precise conception and rigorous reason. To think aright is no characteristic striving of a class of men. It is a common aspiration. Only, as before said, the stuff of thought is mostly intractable, formless, nebulous, like some milky way awaiting analysis into distinct star forms of completely determinate ideas.

The mentioned aspiration and the tendence of all thought, of all science, to assume the character of mathematics admit of many illustrations, which at the same time serve to show clearly the ultimate distinction between that thought which is mathematical and that which is not. One or two such illustrations must suffice.

There is no more common or more important scientific notion than that of function. The term is applied to either of two variable things (including constants conceived as special variables, whose variation is zero in amount) so related that to any value or state of either there corresponds one (or more) value (values) or state (states) of the other. Any two corresponding values or states are said to constitute a pair of values or states, and any two functionally related variables may be called a function-pair. Examples of such function-pairs abound on every hand, as the radius and the area of a circle; the corresponding values of x and y in an equation, $2x-3y+5=0$; elasticity of medium and velocity of sound or other undulation; the amount of sodium chloride formed and the time occupied by the reaction that generates it; the prosperity of a given community and, *ceteris paribus*, the intelligence of its patriotism. Indeed it may be that there is no thing which is not in some sense a function of every other. Be this as it may, one thing is very certain, namely, a very great part, if not the whole, of our thinking is primarily concerned with functional relationships, deals, that is, immediately or mediately with pairs or systems of corresponding values or states or changes. Behold, for example, how the parallelistic psychology searches for correlations between psychical and physical phenomena. Witness, too, the sociologist seeking to determine a law of correspondence between the homogeneity of a population and its peacefulness; the anthropologist attempting to find a formula correlating mental power and brain-weight; the physicist's determinations of dependence between pressure and volume of a gas; and so on and so on. It is, then, here, in the immense and wondrously diversified domain of correspondence, the answering of value to value, of change to change, of condition to condition, of state to state, that the knowing activity, the intellect, finds its field.

What is it precisely that we seek to do by means of a correlation? The answer is: when one or more facts are given or known, to pass with absolute certainty to the correlative fact or

facts. For example, if $y = \sin x$, then, if a value be assigned to x or y, the corresponding value or values of y or x are determined by the equation, or definition, of the functional correspondence between the assemblage of values which x may take and the assemblage that y may assume. To effect the desired transition from the given or known to the dependent ungiven or unknown obviously requires one or more formulæ or equations which shall serve to define precisely the manner of correspondence, the law of dependence. Where do such defining formulæ or equations come from? Strictly speaking, they are never *found*, they are always *assumed*, assumed immediately or else mediately, that is, in the latter case, derived by assumed logical processes from such as belong to the former case. This statement is valid in every field of logical thought. In every field it is true that from nothing assumed nothing can be derived. Now, nothing is easier than to write down a perfectly definite formula that does not tell how cheerfulness depends on climate or retentiveness on interest or the volume of a cube on its dimensions. The mentioned inapplicability or "inutility" does not, however, at all tend to invalidate the formula regarded as defining a certain law of correlation. Indeed a given formula may be perfectly intelligible in itself; it, alone or joined with others in similar case, may state a perfectly intelligible law of correspondence, which, nevertheless, may have no validity whatever in the physical or in the sensuous universe. What is it, then, that guides in the choice of formulæ? For such determination or choice seems hardly referable to chance alone. The answer is that, broadly speaking, choice is determined by curiosity, and curiosity is itself not determined by choice, but is rather matter of native gift or predilection.

Just here we are in position where we have only to look steadily a little in order to perceive clearly the sharp and ultimate distinction between mathematics, on the one hand, and physical or other science, on the other. These are discriminated according to the kind of curiosity whence they spring. The mathematician is curious about definite abstract relationships, about logically possible modes of order, about varieties of abstract implications, about completely determined or determinable functional relationships considered solely in and of themselves, that is, without the slightest concern about the question whether or no they have external or sensuous or other sort of validity than that of being logically thinkable. It is the aggregate of logically thinkable relationships that constitutes the mathematician's universe, an indefinitely infinite universe, worlds in worlds of worlds in worlds of wonders, inconceivably richer in mathetic content than can be any outer world of sense. Immense indeed and marvelous is our own world of sense with its rolling seas and stellar fields and undulating ether. But compared, one need not say with the entire world of mathesis, but only with the hyperspaces (see HYPERSPACES) explored by the geometrician, the whole vast region of the sensuous universe is literally as a merest point of light in a shining sky.

Now this mere speck of a physical universe, in which the chemist, the physicist, the astronomer, the biologist, the sociologist, and the rest of nature students, find their great fields, may be, as it somewhat seems to be, a realm of invariant uniformities or laws; it may be a mechanically organic aggregate, connected into an order whole by a tissue of completely definable functional relationships; and it may not. In other words, it may be that the universe eternally has been and is a genuine cosmos, that the external sea of things immersing us, although it is ever changing infinitely, changes only lawfully, in accordance with a system of immutable laws, constituting an *invariant* (see INVARIANTS AND COVARIANTS) at once underived and indestructible and securing everlasting harmony through and through; and it may not be such. The student of nature assumes, he rightly assumes, that it is, and, moved and sustained by appropriate curiosity, he endeavors to find in the outer world what are the elements and relationships assumed to be valid there. "Natural science," said Bernhard Riemann, "is the attempt to comprehend nature by means of exact concepts." The mathematician, as such, does not make that assumption and does not seek for relationships in the outer world.

Is the assumption correct? Undoubtedly it is admissible, and as a working hypothesis it is undoubtedly very useful or even indispensable to the student of external nature; but is it true? The mathematician, as man, does not know although he greatly cares. Man, as mathematician, neither knows nor cares. The mathematician does know, however, that, if the assumption be correct, every relationship that is valid in nature is, *in abstractu*, an element in his domain, a subject for his study. He knows, too, at least he strongly suspects, that, if the assumption be not correct, his domain remains the same absolutely. The two realms, of mathematics, of natural science, like the two attitudes, the mathematician's and that of the nature student, are fundamentally distinct and disparate. To think logically the logically thinkable — that is the mathematician's aim. To assume that nature is thus thinkable, an embodied rational logos, and to discover the thought supposed incarnate there — these are at once the principle and the hope of the student of nature.

Suppose the latter student is right, suppose the outer universe really is an embodied logos of reason, an infinitely intricate garment ever weaving and ever woven, warp and weft, of logically determinate relationships, does that imply that all of the logically thinkable is incorporated in it? It seems not. A cosmos, a harmoniously ordered universe, one that through and through is self-compatible, can hardly be the whole of reason materialized and objectified. There appears to be many a rational logos. At any rate the mathematician has delight in the construction and contemplation of divers systems that are inconsistent with one another, though each is composed of consistent relationships. He constructs in thought, as witness the geometry of hyperspaces, ordered worlds, worlds that are possible and logically actual, and he is content not to know if any of them be otherwise actual or actualized. There is, for example, a Euclidean geometry and there are infinitely many kinds of non-Euclidean (see NON-EUCLIDEAN GEOMETRY). These theories

regarded as «applied» mathematics, regarded, that is, as *true* descriptions of some one actual space, are incompatible. In our universe, to be specific, if it be, as Plato thought and nature science takes for granted, a geometrized or geometrizable affair, then one of these geometries may be objectively valid in it. But in the vaster world of thought, in the world of pure mathesis, all of them are valid; there they coexist, and interlace among themselves and others as differing strains of a hypercosmic harmony.

A geometry, indeed any mathematical theory, consists of a definite system of determinate compatible principles or assumptions or hypotheses or postulates (commonly called axioms) together with their implications, their logically deducible consequences. Accordingly, natural science, the term being broadly employed to signify knowledge that is ultimately dependent upon «observation and experiment,» cannot be or become strictly mathematical. It aspires to the *character*, and approximates and imitates the *form*, of mathematics, but it can never really attain either. Mathematics is concerned with implications, not applications. Such terms as «applied mathematics,» «mathematical physics,» and the like, are indeed in common use, but the signification, rightly understood, is always that of a mixed doctrine, a doctrine that is thoroughly analyzable into two disparate parts: one of these consists of determinate concepts formally combined in accordance with the established canons of ratiocination, i.e., it is pure mathematics and not natural science; the other is matter of observation and experiment, i.e., it is natural science and not mathematics. No fibre of either component is a filament of the other. Whether the behavior of natural phenomena is or is not exactly descriptible by mathematical formulæ can never be ascertained, for the means to «natural knowledge,» viz., observation and experiment, are fallible by nature, and, however refined or prolonged, are incapable of yielding absolute exactness or certainty. Of any so-called law of nature, «the most, the last, the best that can be said» is that its agreement with the facts is so nearly perfect that every discrepance, if any there be, has escaped detection.

Cannot the like be said of mathematics? In the foregoing conception of mathematics it has indeed been tactily assumed that some ideas are completely determinable, that there are possible systems of postulates absolutely free alike from obscurity and from interior contradiction, that the postulates of such a system import a perfectly definite body of ascertainable implications, and that there is a perfect standard of logic quite independent of time and place and of the defects and idiosyncrasies of individual reasoners. May not these assumptions, some or all of them, be incorrect? There are some grounds, historical and biological, for suspecting that such may be the case. Such an admission, however, whether tentative or unconditioned, has by no means the effect of undefining mathematics or of dethroning the science from its commanding position among the knowledges. It would indeed leave man without the possession, even without the hope, of *absolute* knowledge, but, among all the forms of actual or potential proximate knowledge, mathematics would still rightly rank as highest. It would indeed be marked by a degree of uncertainty or indeterminateness or relativity or inexactness, viz., that degree of inexactness which by supposition would belong to *all* meanings and standards. Hence it would not be peculiar to mathematics, but would be common to it and every other science. But every such «other science» has an *additional* mark of indeterminateness, the characteristic inexactness of all possible observation and experiment. In any case, then, the observational and experimental sciences are, in respect to certainty and exactness, hopelessly inferior to mathematics.

But in all ages it has been the faith of the mathematician that complete determination of concepts and absolute rigor of demonstration are in fact attainable, not, however, in the realm of observation and experiment, but in the world of pure thought. It is, then, in that world, where all *entia* dwell, where is every type of order and every manner of correlation and every variety of relationship and every form of implication, it is in this infinite ensemble of eternal verities whence, if there be one cosmos or many of them, each derives its character and mode of being,— it is there that the spirit of mathesis has its home and its life.

Is it a restricted home, a narrow life, static and cold and gray with logic, without artistic interest, devoid of emotion and mood and sentiment?

That world, it is true, is not a world of solar light, it is not clad in the colors that glorify the things of sense, but it is an illuminated world, and over it all and everywhere throughout are hues and tints transcending sense, painted there by radiant pencils of psychic light, the radiance in which it lies.

It is a silent world. Nevertheless, in respect to the highest principle of art — the interpenetration of content and form, the perfect fusion of mode and meaning — it even rivals music.

In a sense, it is a static world, like those of the sculptor and the architect. The figures, however, which reason constructs and the mathetic vision beholds, transcend the temple and the statue, alike in simplicity and in intricacy, in delicacy and in grace, in symmetry and in poise.

Not only are this home and this life, thus rich in æsthetic interests, really controlled and sustained by motives of a sublimed and supersensuous art, but the religious aspiration, too, finds there, especially in the beautiful doctrine of invariants, the most perfect symbols of what it seeks — the changeless in the midst of change, abiding things in a world of flux, configurations that remain the same despite the swirl and stress of countless hosts of curious transformations.

Literature.— The literature having for its object the exposition of the nature and principles of mathematics is extensive. By far the most important recent contribution, which at the same time serves to introduce the reader to the chief memoirs in the field, is B. Russell's 'The Principles of Mathematics,' Vol. I. For an excellent critical review of the principal modern attempts to define mathematics, the reader may be referred to Prof. M. Bôcher's 'The Fundamental Conceptions and Methods of Mathematics' ('Bull. of the American Math. Soc.,' Vol. XI). Consult also Whitehead,

A. N., and Russell, B. A. W., 'Principia Mathematica' (Cambridge 1910–); Whitehead, A. N., 'Introduction to Mathematics' (Home University Library).

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MATHER, măt'h'ér, Cotton, American colonial clergyman, son of Increase Mather (q.v.): b. Boston, 12 Feb. 1663; d. there, 13 Feb. 1728. He entered Harvard College at 11, and at his graduation in 1678 President Oakes expressed his expectation that he would resemble his venerable grandfathers, John Cotton and Richard Mather, who should be united and flourish again in him. He was early distinguished for piety, and in his 14th year began a system of rigid and regular fasting and vigils which he continued through life. He was occupied after leaving college with teaching, in 1680 became the assistant of his father in the pastorate of the North Church, Boston, and in 1684 was ordained as his colleague. When, at the report of the landing of the Prince of Orange in England, Governor Andros was seized and imprisoned in Boston, Cotton Mather prepared the public declaration justifying the measure. But it is in connection with proceedings concerning witchcraft that he is most generally known. In 1685 he published his 'Memorable Providences relating to Witchcraft and Possessions,' narrating cases which had occurred at intervals in different parts of the country; and during the witchcraft excitement in Salem in 1692 was a prejudiced investigator in the matter, publishing the next year his 'Wonders of the Invisible World,' in order to confirm believers in that kind of demoniac possession. In 1702 appeared his greatest work, 'Magnalia Christi Americana,' an ecclesiastical history of New England concerning which he was admitted to know more particulars than any other man. Though strongly marked by his partialities and prejudices, its somewhat quaint and grotesque character, its admixture of superstition, learning and ingenuity, make it still interesting. In 1713 his 'Curiosa Americana' was read before the Royal Society of London, and he was elected a member of that body, being the first American to receive this distinction. In its 'Transactions' in 1721 appeared an account of the practice of inoculation for the smallpox, introduced by Lady Mary Wortley Montagu; and it was by the efforts of Mather in connection with Dr. Boylston, against both professional and popular prejudice, that the operation was first performed in Boston. His 'Essays to Do Good' (1710) was admitted by Dr. Franklin to have influenced some of the principal events of his life; and his 'Christian Philosopher' and 'Directions for a Candidate of the Ministry' enjoyed high repute. His 'Parentator' (1724) is a life of his father, Increase. Vain and pedantic as he was and narrow and credulous as he showed himself to be in regard to witchcraft and other topics of his time, he was in many directions a useful, public-spirited citizen who deserves to be regarded more leniently by posterity than has sometimes been the case. Consult 'Life' by Samuel Mather (Boston 1729); Pond, Enoch, 'The Mather Family' (ib. 1844); Marvin, A. B., 'Life and Times of Cotton Mather' (ib. 1892); Wendell, Barrett, 'Cotton Mather' (1891); Tyler, 'History of American Literature' (Vol. II, New York 1881).

MATHER, Frank Jewett, Jr., American professor of art: b. Deep River, Conn., 6 July 1868. In 1889 he was graduated at Williams College, and subsequently studied at Johns Hopkins (Ph.D. 1892), the University of Berlin and L'École des Hautes Études, Paris. From 1893 to 1900 Dr. Mather was instructor and assistant professor of English and Romance languages at Williams College; was editorial writer on the New York *Evening Post*, assistant editor of *The Nation* in 1901–06; art critic of the *Evening Post* in 1905–06 and again in 1910–11 and American editor of the *Burlington Magazine* in 1904–06. In 1910 Dr. Mather became Marquand professor of art and archæology at Princeton University. He is the author of 'Homer Martin, Poet in Landscape' (1912); 'The Collectors,' short stories (1912); 'Estimates in Art' (1916), also several literary and philological monographs. He is a contributor, chiefly on art, to *The Nation*, and other periodicals. In 1917 he served as chief boatswain's mate in the United States Naval Reserve Fleet (coast patrol).

MATHER, Increase, American colonial divine, son of Richard Mather (q.v.): b. Dorchester, Mass., 21 June 1639; d. Boston, 23 Aug. 1723. He was graduated at Harvard College in 1656, and in 1658 at Trinity College, Dublin. He afterward preached in Devonshire and the island of Guernsey, and on the Restoration was urged to conform and settle in England; but he refused, and on his return to Boston was invited to preach to the North Church, of which he was ordained pastor in 1661. This office he held for 62 years. He was a member of the synod of 1679, and drew up the propositions which were adopted concerning the proper subjects of baptism. In 1681 he was elected president of Harvard College, but the reluctance of his church to relinquish him induced him to decline the position. In 1684 the office was again offered him, and he accepted it with a stipulation that he should retain his relation to his people. He continued in this station till 1701, when he retired in consequence of an act of the general court requiring the president to reside in Cambridge. He received the first diploma for the degree of D.D. that was granted in America. When in 1683 Charles II demanded that the charter of Massachusetts should be resigned into his hands, Mather was foremost in opposing the measure; and when that monarch annulled the charter in 1685, he was sent to England as agent for the colonies. He was in England during the revolution of 1688, and, having found it impossible to obtain a restoration of the old charter, accepted a new one, under which the appointment to all the offices reserved to the Crown was confided to him. He returned in 1692, when the general court appointed a day of thanksgiving for his safety and for the settlement of the dispute. He is stated to have condemned the violent proceedings which followed relating to witchcraft. He was accustomed to spend 16 hours every day in his study, and always committed his sermons to memory. One-tenth part of all his income was devoted to purposes of charity. He was the author of 92 distinct publications. His 'Remarkable

Providences' was republished in the 'Library of Old Authors' (1856), and other works by him are 'A Brief History of the War with the Indians in New England' (1676); 'Relation of Troubles of New England from the Indians' (1677; 1864); 'Cases of Conscience Concerning Witchcraft' (1693; 1862); 'Cometographia, or a Discourse Concerning Comets' (1683). Consult Pond, Enoch, 'The Mather Family' (Boston 1844); Walker, Williston, 'Ten New England Leaders' (New York 1901); Tyler, M. C., 'History of American Literature' (Vol. II, New York 1881); Sibley, 'Harvard Graduates' (Vol. I, Cambridge 1873).

MATHER, Richard, American colonial divine: b. Lowton, Lancashire, England, 1596; d. Dorchester, Mass., 22 April 1669. He became a schoolmaster at Toxteth Park, near Liverpool, at the age of 15; studied at Brazenose College, Oxford, in 1618; was ordained in the English Church soon after, and became the minister of Toxteth, in which position he remained 15 years. He was suspended for non-conformity to the ceremonies of the Established Church in 1633, and though soon restored by the influence of friends was again silenced in the following year. He therefore decided to emigrate to New England, arriving in Boston in August 1635. The next year he became pastor of the church in Dorchester, and held that position till his death. He was one of the compilers of the 'Bay Psalm Books' and assisted to frame in 1648 a model of discipline known as the Cambridge Platform. He married for his second wife the widow of John Cotton (q.v.). His 'Journal, Life and Death' was issued by the Dorchester Historical Society in 1850. See CONGREGATIONALISM and consult Mather, Increase, 'Life and Death of Richard Mather' (Cambridge 1670); Tyler, M. C., 'History of American Literature' (Vol. II, New York 1881).

MATHER, Robert, American lawyer and railroad official: b. Salt Lake City, 1859; d. 1911. In 1882 he was graduated at Knox College, Illinois, and four years later was admitted to the bar at Chicago. He practised in that city in 1886–89; was local attorney in 1889–94, assistant general and general attorney in 1894–1902, and general counsel in 1902–09 of the Chicago, Rock Island and Pacific Railroad. In 1909 he was elected chairman of the board of the Westinghouse Electric Company. Mr. Mather was interested, as officer or director, in several railroad and industrial companies.

MATHER, William Williams, American geologist: b. Brooklyn, Conn., 24 May 1804; d. Columbus, Ohio, 26 Feb. 1859. He was graduated from West Point in 1828 and was an assistant professor of chemistry and geology there, 1829–35. After a short period spent as professor of chemistry at the University of Louisiana (1836), he undertook the superintendence of a geological survey of the 1st district of New York State which included the Hudson River counties, a labor which lasted from 1836 to 1844. He was also State geologist of Ohio 1837–40, and of Kentucky 1838–39, and from 1842–45, and 1847–50, professor of natural science in the Ohio University at Athens. He made a collection of about 22,000 mineralogical specimens. He contributed frequently to scientific journals, edited the *Western Agriculturist* for a time and published 'Geology of the 1st Geological District' (in 'Natural History of New York,' 1843); and 'Elements of Geology.'

MATHESON, măth'ĕ-sŏn, **Arthur James,** Canadian statesman: b. Perth, Ontario, 1842; d. 1913. He received his education at Upper Canada College and Trinity College, Toronto; was called to the bar in 1870 and established a practice in his native town of which he was mayor in 1883–84. From 1894 to 1913 he was a member of the Conservative party in the Ontario legislature and served as provincial treasurer in 1905–13 under Premier Sir James P. Whitney. In 1906 he was a member of the Ottawa Inter-provincial Conference and in the following year of the National Conference on Taxation. In 1910 he served as vice-president of the International Commission. Mr. Matheson was made K.C. in 1908. He served in the militia after 1866, saw service during the Fenian raids and in 1900 attained the rank of brigadier-general.

MATHESON, George, Scottish Presbyterian clergyman: b. Glasgow, 27 March 1842; d. 28 Aug. 1906. He was educated at Glasgow University and although he had lost his sight in boyhood he entered the ministry of the Kirk of Scotland and was ordained in 1868. He was minister of Innellan on the Firth of Clyde 1868–86; and of Saint Bernard's Parish, Edinburgh (1886–97). He was the author of the famous hymn, 'O Love that Will Not Let Me Go,' which finds a place in nearly every modern hymnal. Among his many published books are 'Aids to the Study of German Theology' (1874); 'Natural Elements of Revealed Theology' (1881); 'The Psalmist and the Scientist' (1887); 'Sidelights from Patmos' (1897); 'The Sceptre Without a Sword' (1901); 'Representative Men of the Bible' (three series); and 'Representative Women of the Bible' (1907).

MATHESON, Samuel Pritchard, Canadian clergyman: b. Manitoba (then the Red River Settlement), 20 Sept. 1852. He received his education at Saint Johns' College School and Saint John's College, Winnipeg. He received deacon's orders in the Anglican Church in 1875 and those of priest in 1876. He became master at Saint John's College School; subsequently served as professor of exegetical theology at Saint John's College, canon and dean of Saint John's Cathedral, deputy headmaster and headmaster of Saint John's College School. Subsequently he was warden and chancellor of Saint John's College. He became secretary of the Provincial Synod of Rupert's Land, and prolocutor of same and in 1902 became prolocutor of the General Synod of Canada. In 1903 he became coadjutor bishop of Rupert's Land, in 1905 he became archbishop and in 1909 was made Primate of all Canada.

MATHEW, Theobald, known as "FATHER MATHEW," Irish temperance reformer: b. Thomastown Castle, County Tipperary, Ireland, 10 Oct. 1790; d. Queenstown, Ireland, 8 Dec. 1856. He was educated at Maynooth College and the Capuchin Convent, Cork, and was ordained to the Roman Catholic priesthood in 1814. In 1838 he inaugurated a temperance crusade and his labors in Great Britain and Ireland induced hundreds of thousands to sign the total abstinence pledge. The most conclusive evidence of the benefit of his preaching

was the reduction of nearly £600,000 on the duties of spirits imported in Ireland in five years. He made a tour of the United States in 1849–51 and was very successful. Though pensioned by the queen he was never entirely relieved from the burden of debt with which his extended tours had burdened him, and which caused his imprisonment for a time in 1847. Consult 'Life' by J. F. Maguire (London 1863; abridged ed., 1890); Matthew, F., 'Father Mathew: his Life and Times' (London 1890); Tynan, K., 'Father Mathew' (ib. 1908).

MATHEWS, măth'ŭz, **Abert,** «PAUL SIEGVOLK,» American lawyer and author: b. New York, 8 Sept. 1820; d. there, October 1903. He was graduated from Yale in 1842 and after studying law was admitted to the New York bar in 1845. He soon acquired an extensive practice and was especially skilled in chancery practice. He found time for literary work despite the claims of his profession, and under the pseudonym «Paul Siegvolk» published 'Walter Ashwood,' a once popular love story (1860); 'A Bundle of Papers' (1879); 'Thoughts on Codification of the Common Law' (1881); 'Ruminations: The Ideal American Lady and Other Essays' (1892); 'A Few Verses' (1893), etc. In the early part of his career he was a close friend of N. P. Willis, whom he aided in establishing *The Home Journal.*

MATHEWS, Charles, English actor: b. London, 28 June 1776; d. Plymouth, England, 28 June 1835. He made his début as an actor in Richmond in 1793 and was subsequently engaged for some years in Dublin and London. In 1818 he made a hit as a professional entertainer in his 'At Home.' He continued in this class of work, making two successful trips to the United States and, returning, presented in England with great success 'A Trip to America.' In 1828 he became joint proprietor of the Adelphi Theatre, London. Consult Baker, 'Our Old Actors' (London 1881); Mrs. Mathews, 'Memoirs of Charles Mathews, Comedian' (London 1839).

MATHEWS, Charles James, English actor: b. Liverpool, 26 Dec. 1803; d. Manchester, England, 24 June 1878. He was the son of Charles Mathews (q.v.) and was educated as an architect, but abandoned that calling for the stage. As a light comedian he was very successful, but his attempts at managing Covent Garden and the Lyceum Theatre in London were failures. He made several trips to the United States, Paris and Australia, presenting an entertainment similar to his father's famous 'At Home.' Consult Dickens, Charles, 'Life of Charles James Mathews' (London 1879).

MATHEWS, Edward Bennett, American geologist: b. Portland, Me., 16 Aug. 1869. In 1891 he was graduated at Colby College and in 1894 received the degree of D.Ph. at the University of Johns Hopkins. In 1891–94 he was field assistant of the United States Geological Survey; in 1894–95 was instructor in mineralogy and petrography, in 1895–99 associate, in 1899–1904 associate professor and since 1904 professor of geology at Johns Hopkins. Since 1917 he has served as chairman of the geological department. From 1898 to 1917 Dr. Mathews was assistant State geologist of Maryland and after 1917 was State geologist. He published 'Bibliography and Cartography of Maryland' (1897); 'Maps and Map-Makers of Maryland' (1898); 'Building Stones of Maryland' (1898); 'Limestones of Maryland' (1910); 'History of the Mason-Dixon Line'; 'Physical Features of Maryland'; 'Water Resources of Maryland,' and numerous geological and historical papers.

MATHEWS, Ferdinand Schuyler, American artist and author: b. New Brighton, N. Y., 30 May 1854. He was educated at Cooper Institute, studied art in Italy and has made a specialty of decorative designing. He has contributed extensively to the magazines both as illustrator and writer, in the latter field dealing chiefly with subjects which come within his own profession and also those which belong to natural science. He has published 'The Writing Table of the 20th Century' (1900); 'The Field-Book of American Wild Flowers' (1902); 'Field-Book of Wild Birds and their Music' (1904); 'Field-Book of American Trees and Shrubs' (1915), etc.

MATHEWS, Joseph McDowell, American surgeon: b. Newcastle, Ky., May 1847. He was educated at the Newcastle Academy and at the University of Louisville. He practised in Louisville and was appointed professor of surgery at the Louisville Hospital College of Medicine. He is president of the Kentucky State Board of Health and in 1898–99 was president of the American Medical Association. He published 'Diseases of the Rectum, Anus and Sigmoid Flexure' (1893; 3d ed., 1903); and 'How to Succeed in the Practice of Medicine' (1902).

MATHEWS, Shailer, American educator: b. Portland, Me., 26 May 1863. He was graduated from Newton Theological Institution in 1887 and studied in Berlin. In 1887 he was appointed assistant professor of rhetoric at Colby University and in 1889 accepted the chair of history and political economy, which he occupied until 1894, when he was made associate professor of New Testament history in the University of Chicago. In 1897 he was made professor, in 1899 junior dean, in 1905 professor of systematic theology, in 1906 professor of history and comparative theology and in 1908 dean of the Divinity School. In 1911 he was elected president of the Western Economic Society, in 1908 president of the Co-operative Council of City Missions, in 1910 president of the Chicago Baptist Executive Council, in 1912 president of the Federal Council of the Churches of Christ in America and in 1915 president of the Northern Baptist Convention. He is director of religious work in Chautauqua Institution, New York, and one of the trustees of the Church Peace Union founded by Andrew Carnegie. In 1915 he visited Japan as a representative of the Federal Council of the Churches of Christ in America. He gave the Haverford Library Foundation Lectures in 1907, the Earle Lectures, Berkeley, Cal., in 1913, and the Merriam Lectures, Worcester, Mass., in 1914. He was editor of the *World To-day* from 1903 to 1911 and has been editor of *The Biblical World* since 1913. He is also editor of New Testament handbooks, 'The Bible for Home and School,' 'Social Betterment,' handbooks of ethics and religion, Women Citizen's Library and associate editor of the 'Dictionary

of the Bible,' *American Journal of Theology, Constructive Quarterly.* He is the author of 'Select Mediæval Documents' (1891; 1900); 'The Social Teaching of Jesus' (1897); 'A History of New Testament Times in Palestine' (1899); 'Constructive Studies in the Life of Christ,' with E. D. Burton (1901); 'The French Revolution — A Sketch' (1901); 'Principles and Ideals for the Sunday School,' with E. D. Burton (1903); 'The Messianic Hope in the New Testament' (1905); 'The Church and the Changing Order' (1907); 'The Social Gospel' (1909); 'The Gospel and the Modern Man' (1909); 'Scientific Management in the Churches' (1911); 'The Making of Tomorrow' (1913); 'The Individual and the Social Gospel' (1915); 'The Spiritual Interpretation of Modern History' (1916).

MATHEWS, William, American author: b. Waterville, Me., 28 July 1818; d. Boston, Mass., 14 Feb. 1909. He studied law at Harvard and was admitted to the bar in 1838, practising for a time in Waterville, but abandoned law for journalism, establishing the *Watervillonian* in 1841, which later he named the *Yankee Blade.* In 1859–62 he was engaged in journalism in Chicago. In 1862 he was appointed professor of English and rhetoric at the University of Chicago, but in 1875 resigned in order to devote himself exclusively to literature. Among his books are 'Getting on in the World' (1873); 'The Great Conversers' (1874); 'Words: Their Use and Abuse' (1876); 'Oratory and Orators' (1870); 'Literary Style' (1881); 'Men, Places and Things' (1888); 'Wit and Humor: Their Use and Abuse' (1888); 'Nugæ Literariæ' (1896); 'Conquering Success' (1903), etc.

MATHEWS, William Smythe Babcock, American musical writer and editor: b. Loudon, N. H., 8 May 1837; d. 1912. He obtained his musical education in Boston and became a teacher in 1853; he was for a time engaged at the Wesleyan Female Seminary in Georgia, but in 1867 he removed to Chicago, where he was prominent as an organist and engaged in editorial work and criticism of music on the leading Chicago papers. In 1891 he established the magazine, *Music,* and edited it until 1903, when it became a part of the *Philharmonic.* He is the author of 'Outlines of Musical Form' (1867); 'Emerson Organ Method' (1870); 'How to Understand Music' (1880–88); 'Music and Its Ideals' (1897); 'Dictionary of Musical Terms' (1895); 'Popular History of Music' (1901); 'The Great in Music' (1900–03), etc.

MATICO (*piper angustifolium*), a shrub of the natural order Piperaceæ, native of Peru; remarkable for the styptic property of its leaves and unripe fruit, used for stanching wounds.

MATIN, a large hound-like French dog, resembling the Great Dane, but having a rough coat. The head is elongated, the forehead flat, the ears pendulous toward the tips; color, yellowish-fawn or whitish. It is commonly employed in France as a sheep-dog and watchdog.

MATINS, the daily office of morning prayer in the Anglican communion. It is composed in part of the pre-Reformation offices of Matins and Lauds. In the Roman Catholic Church, the first portion of the Divine Office, with which Lauds are usually associated. On Sundays and double feasts matins have three nocturns; on simple feasts and week-days, one nocturn. Easter and Pentecost have each only one nocturn, with three psalms. After private prayer versicles and responses are recited; the invitatory psalm follows. In the first nocturn are said three psalms on feast days, 12 when the office is of the Sunday and three lessons from Scripture; the second and third nocturns have each three psalms and the lessons are chosen from the patristic writings for the second, and from some commentary on the Gospel of the day of the third nocturn.

MATRIARCHATE, position or power of a matriarch, a name formerly given to the wife of a patriarch. Among the Indians the mother is considered of superior importance in families, clans or tribes. Job's wife, Xantippe, and others in history have been called matriarchs. In certain primitive tribes the mother, in line of descent and inheritance, takes precedence of the father. Consult Bachofen, J. J., 'Das Mutterrecht' (2d ed., Basel 1897); Dargan, 'Mutterrecht und Raubehe' (Breslau 1883); Westermarck, E. A., 'History of Human Marriage' (3d ed., London 1903).

MATRIMONY VINE. See LYCIUM.

MATRONALIA, the 1st of March, the New Year's day of the Roman religious calendar, sacred to Juno, the deity of matrons. On this festival day wives expected presents from their husbands, and themselves gave an entertainment to the household slaves. Consult Fowler, W. W., 'Roman Festivals' (London 1899).

MATSUDAIRA, mah-tsu-digh'rah, the generic name of 52 families of territorial nobles in feudal Japan, mostly, although not all, descended from an ancestor Minamoto Chikauji of the 14th century, 11th in generation from Yoshiiyé who, in the village of Matsudaira, in Mikawa, espoused the daughter of Matsudaira Nobushige and took his wife's name. When, in Yedo in 1604, the Tokugawa line of showguns was established, permission was given to the heads of allied or loyal clans to bear this name. Among the hundreds of feudal barons and others thus favored have been many of the most illustrious in the period 1604–1868. After this date, the name, with the privilege of bearing the ancestral coat of arms, was restricted to 27 families, which now comprise a marquis, 3 counts, 22 viscounts and 1 baron. Their heraldic crest consists of three mallow leaves within a circle. With the exception of Fujiyama, this is the most characteristic decoration seen on the older Japanese art products. It is said to have been selected by Iyeyasu, when by a loyal vassal three cakes, laid over as many mallow leaves, on a plate, were presented for the conqueror's refreshment. Consult Dixon, 'Japan' (1869); Griffis, 'Th Mikado's Empire' (1912), and La Tourette, 'The Development of Japan' (1918).

MATSUDAIRA SHUNGAKU, mah-tsu-digh-rah shoon'gah-ku, champion, during Jajan's hermit days, of Western civilization and of friendship with the United States: b. Yedo, 11 Oct. 1828; d. Tokio, 1880. Adopted at 10 years of age by Matsudaira, baron of Echizen, at 21 he began sweeping and con-

structive reforms, introducing modern military, economic and hygienic methods, abolishing archery in favor of fire arms, establishing cannon and rifle factories, sending young men as students to the Dutch at Nagasaki, establishing lectures on the Oyoméi (q.v.) philosophy and writing manifestoes. He combatted popular prejudices, showed the superiority of Western civilization and the reasonableness of Christianity, compelled the use by doctors of the Western methods of medical practice, opened a dispensary and organized a foreign literature department in the excellent clan school in Fukui. Opposed to opening the country prematurely, on unequal terms, as was done by Ii Naosuké, he suffered domiciliary confinement but was later called to be virtual premier of the empire. With the assistance of Yokoi Héishiro he abolished the century-old custom of compelling the feudal barons to live half the year in Yedo, leaving their families as hostages when away. This made Kioto the centre of affairs. He later brought the first of the yatio in his domain, and here the first public schools beyond the treaty ports were organized, and one of the very first of the new regiments of the peasant national army was raised. Out of this region, chiefly, was raised the famous Ninth Division that took Port Arthur. High posthumous honors were awarded this pioneer of Western civilization. His biography and writings have been compiled by his son the marquis. Consult Griffis, 'The Mikado: Institution and Person' (1915), and 'The Mikado's Empire' (1912).

MATSUKATA, Masayoshi, mā-sī-ō'shē mät-soo-kā'tä, MARQUIS, Japanese statesman: b. Satsuma 1835. He was son of a Samurai, but fell in with the Radical party; was made head of the prefecture (or *ken*) of Hida after the revolution; was prominent in the tax reform of 1875; represented Japan in several industrial exhibitions; was a member of the Cabinet, in 1880 as Minister of Commerce, in 1881 as Minister of Finance, and, with the same portfolio, as Prime Minister from 1891 to 1893. His great work was in 1896–97, when he formed a new cabinet, carried through the gold standard, set Japanese credit on its feet, but he was forced to retire because of the ill-success of his scheme of taxation. He was Minister of Finance a second time in 1898–1900, became Privy Councillor in 1903, and received the title of marquis in 1906. He was also president of the Japanese section of the Red Cross.

MATSUMOTO, Japan, town, in the district of Nagano, in the island of Hondo, 100 miles north by west of Tokio. The town manufactures baskets, preserved fruits and silks and has an old daimyo castle. Pop. 35,000.

MATSUMURA, Ninzo, Japanese botanist: b. Ibaraki-Ken, 1856. In 1886–88 he studied at the universities of Würzburg and Heidelberg, meanwhile holding the assistant professorship of botany in the University of Tokio to which he had been appointed in 1883. He became full professor in 1890 and seven years later was appointed director of the Botanical Gardens. He collaborated in Brinkley's 'Japanese-English Dictionary' (1896) and published 'Nomenclature of Japanese Plants in Latin, Japanese and Chinese' (1884); 'Names of Plants and their Products in English, Japanese and Chinese' (1892); 'Conspectus of Leguminosæ' (1902); 'Index Plantarum Japonicarum: Cryptogamæ' (1904); 'Phanerogamæ' (1905); 'Tentamen Floræ Lutchuensis,' with Ito (1899); 'Revisio Alni Specierum Japonicarum' (1902); 'Enumeratio Plantarum in Insula Formosa Sponte Crescentium' (1906); 'Chinese Names of Plants' (1915); 'Classified Etymological Vocabulary of the Japanese Language Ancient and Modern' (1915).

MATSUSHIMA, Japan, village on the northeast coast of the island of Hondo, situated on the Bay of Sendai. In a lagoon opposite the village are 808 islets ranging in elevation from 30 to 300 feet and covered with pines. This beautiful natural garden is one of the wonders of Japan.

MATSUYAMA, Japan, town and capital of the district of Ehime, on the island of Shikoku, five miles from Mitsu. It contains a great feudal castle, one of the few perfect specimens of its period in modern Japan. Pop. 44,166.

MATSUYE, or **MATSUE,** Japan, town and capital of the district of Shimane, on the island of Hondo, 140 miles north by west of Kioto. It has large paper manufactories and agate-polishing establishments and has numerous temples. It is well built and is one of the cleanest towns in Japan. Pop. 36,209.

MATSYS, mät-sīs', or **MASSYS, Quentin,** Flemish painter: b. Antwerp or Louvain, about 1460; d. there, between 13 July and 16 Sept. 1530. A blacksmith until he was 20, legend says that he turned artist to win the love of a painter's daughter. He was acquainted with many of the notables of the day, including Dürer, Erasmus and Sir Thomas More. Much of his present fame is due to genre pictures, especially of misers and money-changers, which are not his work, but that of his school, among them his son Jan, whose 'Misers' is at Windsor Castle. Matsys' own work is styled a connecting link between Van Eyck and the latter Dutch realists; apart from such excellent portraits as those of Maximilian of Austria and Petrus Aegidius, it is mostly religious in theme. The 'Burial of Christ,' an altarpiece for the Antwerp Cathedral, now in the Antwerp Museum, and the 'Story of Saint Anne,' now in the Brussels Gallery, are the best examples of his work. The Metropolitan Museum, New York, contains his 'Adoration of the Kings.' Consult Cohen, Walter, 'Studien zur Quentin Metsys' (Bonn 1904) and de Bosschère, Jean, 'Quentin Metsys' (Brussels 1907).

MATTAWA, or **MATTAWAN,** Canada, town in the Nipissing district of Ontario province, situated at the confluence of the Mattawa and Ottawa rivers at the east end of Lake Timiskaming, on the Canadian Pacific Railroad, 45 miles east of North Bay. Great quantities of mica are obtained in the neighborhood. The town has extensive lumber interests and is a distributing point for several great lumber companies. It is also famous as the starting-point of hunters and anglers. Pop. 1,524.

MATTAWA, a river of Ontario, the source of which is Trout Lake, east of Lake Nipissing. It flows east a distance of about 45 miles and enters the Ottawa River at Mattawa, 308 miles from Montreal. This river forms part of an almost continuous water-way from the Ottawa

River to Lake Huron, and before the Canadian Pacific Railroad was built this water route was much used for transportation and travel.

MATTEAWAN, măt-tę-ą-wŏn', N. Y. See BEACON, N. Y.

MATTEI, mät-tā'ē, **Tito,** Italian musician and composer: b. Naples, 1841; d. 30 March 1914. He was educated in Naples. He received the degree of professor in Saint Cecelia's Academy at Rome when he was 11 and was also elected a member of the Philharmonic Society in Florence and other cities. He gave his first concert when 15 and afterward made tours of Europe, but in 1863 settled in London, where he lived for 50 years, confining his concert tours to Great Britain, and in 1870 he conducted an Italian opera at the Lyceum Theatre. He was the composer of hundreds of songs and pianoforte pieces, many of which have become widely popular, and the operas 'Maria di Gand,' 'La Prima Donna,' etc.

MATTER, *in physics, mechanics and chemistry,* the tangible substance of which the world external to our minds is composed and which is characterized by the resistance which it opposes to muscular efforts exerted upon it. Since we can know it only through the mediation of our senses, its actual objective reality has often been questioned by philosophers and metaphysicians; and in order to avoid doubtful points of this sort it is frequently defined merely as a "physical concept," without making any hypothesis as to its objective existence. (Consult Pearson, 'The Grammar of Science'). In physics and chemistry we think and speak of it as having a real existence, however, just as we do in common life. For scientific purposes it is highly important to be able to accurately compare the quantities of matter in two bodies; but the phrase "quantity of matter" is not commonly used in science, the word "mass" (or inertia) being substituted for it. The term "mass" is synonymous with "quantity of matter" so long as the bodies compared are identical in composition and in physical state; but by its use we avoid the uncertainty in the meaning of the longer phrase, when it is applied to bodies of dissimilar composition. Two bodies are said to have "equal masses" under the following conditions: Let the two bodies be conceived to be initially at rest, and free from the action of any external forces whatsoever. Let them then be exposed to the action of equal forces for an equal length of time. If, under these circumstances, the velocities that are produced in the two bodies are equal, the masses of the bodies are also equal, *by definition.* But if the velocities that are produced are unequal, then the masses are also unequal, and are (by definition) proportional to these velocities; the body which is moving the faster being the one whose mass is the less. It would be impossible to carry out an elaborate experiment of this kind every time we wished to compare the masses of a pair of bodies, and it fortunately happens that masses can be compared with great accuracy by merely weighing the bodies against each other in a balance. For equality of weight means that the earth's attractive force is the same upon both; and if (as we know to be the case, by experiment,) the two bodies would fall with the same speed in a vacuum, it follows that equal forces acting upon the two bodies for equal times communicate to them equal velocities; and hence, by the definition of "mass," the mass of the two bodies are equal. It will be noted that mass and weight are two essentially different things, although they are very commonly confused, because they are strictly proportional to each other, according to the most accurate experiments that have yet been made. Yet it is not at all impossible to imagine a state of things in which mass and weight would not be strictly proportional. It is only by experiment, for example, that we know that the earth attracts a body with precisely the same force, whether the body is hot or cold. The attraction between two permanent magnets varies with the temperature, and it may yet be found that gravitative attraction varies in the same way, though to a much smaller extent. Numerous experimenters have in fact fancied that they could detect an effect of this kind, though its reality is not yet admitted. But we can hardly admit that the mass of a body is a function of the temperature; and so we see that the apparently strict proportionality between mass and weight is not at all a necessity of thought, but merely an experimental fact, which may any day be shown to be nothing but a close approximation to the actual truth.

So far as we know, matter can neither be destroyed nor created by any experimental means at our command, nor by any process now operative in nature. This great fact is often called the "law of the conservation of matter," and it appears to be rigorously true. As has been pointed out above, future experiment may show that the weight of a body depends to a slight extent upon its temperature, and it may also be found that the weight of a chemical compound is not always precisely equal to the sum of the weights of its constituents; but it is believed that any irregularities of this sort that may be discovered will hold true to the weight only, and will not affect the mass; and that the weight will also return to its original value when the substance that is weighed is brought back to the same chemical and physical condition again. The gravitative action of matter is one of its most singular attributes, and one which we are still far from understanding. It is apparently true that every particle of matter attracts every other particle with a force which is directly proportional to the product of the masses of the two particles and inversely proportional to the square of the distance between them, and independent of every other circumstance. It is not certain that this law holds true, nor that the attraction exists at all, at distances comparable with the distance from the earth to the fixed stars, but it appears to hold rigorously at distances commensurate with the dimensions of the solar system. Electric and magnetic forces may be either attractive or repulsive; but gravitative action is probably always attractive, the only phenomena which would countenance the opposite view being the apparent repulsion that the sun exerts upon the tails of comets and upon the coronal streamers that are seen at the time of a total solar eclipse.

Matter exists in three (or perhaps four) physical states. All ordinary bodies, for example, may be classified, roughly, either as solids or fluids; fluids being further subdivided into liquids and gases. This classification is not all

that could be desired, since there are certain bodies (such as wax) which have certain characteristics of the solids and certain others of the liquids. A more complete and systematic classification is hardly practicable, however, in the present article. A solid body may be defined as a body capable of resisting a considerable shearing stress. (See ELASTICITY). Solid bodies usually have a considerable tensile strength also. A solid does not yield continuously to a small deforming force; it resists deformation, and its resistance increases as the deformation increases. A fluid, on the other hand, is a substance having almost no shearing strength, and offering very little resistance to forces that tend to change its shape. A fluid yields continuously to a deforming force, and a force that will deform it at all will deform it indefinitely, so long as it is allowed to act. Considering the subdivision of fluids into gases and liquids, we may say that a gas is a fluid that presses continuously and in every direction upon the walls of the vessel containing it and which follows them indefinitely if they retreat. A gas, if left to itself, tends to expand infinitely in all directions. A liquid is a fluid which does not follow the walls of the containing vessel if they retreat and which has no tendency to expand indefinitely if left to itself. (For the prevalent theories regarding the constitution of matter, see GASES, KINETIC THEORY OF; MOLECULAR THEORY).

When a gas is rarefied very highly by a mercury vacuum pump, it exhibits properties which are different in many respects from those manifested by gases in the ordinary state of density. The pressure in such a rarefied gas, for example, may be different in different directions; so that in this respect, at least, the rarefied medium resembles a solid rather than a gas or liquid. Mechanical and electrical properties are also observed at high exhaustions which cannot be reproduced at ordinary pressures; and for these and other reasons Crookes considered that a gas, when under only (say) the millionth or ten millionth of an atmosphere of pressure, may be fairly said to constitute a "fourth state of matter," which he considered to be as different from the gaseous state as the gaseous state is from the liquid state. At first thought this appears to be an extreme and hardly a justifiable view; but it must be remembered that Andrews showed that the distinction between a liquid and the gas or vapor obtained from it by evaporation ceases to exist at temperatures higher than a certain critical value peculiar to each substance. (See CRITICAL POINT). This temperature is about 88° F. for carbon dioxide, and at temperatures progressively higher than this the isothermals of carbon dioxide approximate with increasing closeness to the hyperbolas of a perfect gas. It might be thought that a critical state exists with reference to the solid and liquid states; but this is still somewhat doubtful. It appears probable that no such state exists between a solid and its liquid, unless the solid is crystalline; and its existence has not been established even for this case.

See MOLECULAR THEORY; LIQUEFIED AND COMPRESSED GASES; ELECTRON THEORY; SOLUTIONS; ETHER; VACUUM, etc. Consult, also, Tait, 'Properties of Matter'; Kimball, 'Physical Properties of Gases'; Poynting and Thomson, 'Properties of Matter'; Risteen, 'Molecules and the Molecular Theory of Matter'; Lehmann, 'Molekularphysik.'

MATTERHORN, măt'tĕr-hôrn, **Mount.** See CERVIN, MONT.

MATTESON, măt'ĕ-sŏn, **Tompkins Harrison,** American artist: b. Poughkeepsie, N. Y., 9 May 1813; d. Sherbourne, N. Y., 2 Feb. 1884. His early lessons in art were from an Indian; otherwise he was mostly self-taught until after the success of his 'Spirit of '76,' when he settled in New York and studied in the National Academy. From 1851 until his death his home was Sherbourne. For a time he was a member of the New York legislature. His themes were historical or from American country life, and his best-known pictures are 'The First Sabbath of the Pilgrims,' 'Examination of a Witch,' 'Eliot Preaching to the Indians,' 'Rip Van Winkle's Return from the Mountains,' 'At the Stile' and 'Foddering Cattle.'

MATTHEW. Matthew, the apostle of Jesus Christ, is with sufficient certainty identified with Levi, the son of Alphæus, whose call by Jesus to discipleship is described in Mark and Luke in terms practically identical with a story of the call of Matthew in Matthew. It was not uncommon among the Jews for a man to have two names and sometimes both names were of Hebrew, or Aramaic origin. The derivation and consequently the meaning of the name Matthew is uncertain, though it is commonly interpreted to mean "Gift of God." The mere mention of his father's name does not identify his family to us. He is first spoken of as being in his office as a "publican," or collector of taxes, presumably near Capernaum on the great highway between Damascus and the Mediterranean. While as such officer he would be in the service of the Tetrarch Herod, and not directly in Roman employ, yet he must have shared the obloquy which attached to this office among strict Jews, and it has accordingly been reckoned a mark of his humility that we find him designated as "the publican" in the Gospel which bears his name. After his call to discipleship he made a great feast of farewell, gathering his former friends and business associates to meet his new-found Master and the disciples attending him. The name of Matthew stands in all the lists of apostles, always the seventh or eighth in order, but of his activities as an apostle we have no record. No other name than his has ever been associated with the authorship of the first Gospel, and while this view has been discredited by many critics, because of the difficulty of considering the Gospel in its present form the work of an apostolic eyewitness, it is possible to conserve the historical value of this strongly confirmed tradition by holding that he was the author of the Discourse Document which constitutes such an important and characteristic element in Matthew. (See article MATTHEW, GOSPEL ACCORDING TO). There are many variant traditions as to the missionary labors of Matthew, Macedonia, Egypt, Ethiopia and Parthia having been named as places where he worked. There is no sufficient reason for accepting any of these traditions, though perhaps the last is the most probable. Some traditions assert that he died as martyr and this has been accepted in the Western Church, but according to other

traditions perhaps no less reliable he died a natural death.

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MATTHEW, George Frederick, Canadian geologist: b. Saint John, New Brunswick, 1837. He received his education at the University of New Brunswick; secured a civil service post in 1853 and in 1879 was appointed chief clerk of customs. He was made surveyor of customs in 1893. He collaborated with Bailey, in 1872, in preparing a report on the geology of southern New Brunswick and in the following year prepared a report on the Carboniferous system of that province. Subsequently he made several geological tours of exploration in the Maritime Provinces. He was a Fellow of the Royal Society of Canada and member of the New Brunswick Natural History Society. He published geological papers in various technical and scientific periodicals.

MATTHEW, Gospel According to. The Gospel with which the name of Matthew has uniformly been associated has with almost equal uniformity stood first in the gospel canon. It received this place both because it is the longest of the Gospels and because of the apostolic authority which the name of Matthew gave to it, but the place is fitting also because it relates itself more closely to the Old Testament than does any other gospel.

Contents.—As respects the events recorded, they are much the same as those given in Mark and Luke, and are arranged in substantially the same order. The book may be briefly analyzed somewhat as follows: Introductory, genealogy, birth and infancy of Jesus, ministry of John the Baptist, baptism and temptation of Jesus, i, 1–iv, 11. I. Early Galilean ministry (iv. 12–xii, 50). II. Later ministry in Galilee and neighborhood, and the Perean journey (xiii, 1–xx, 34). III. Entry of Jesus into Jerusalem and his teaching there, mainly controversial (xxi, 1–xxiii, 39). IV. Eschatological discourse (xxiv, 1–xxv, 46). V. Closing scenes, anointing at Bethany, last supper, agony in Gethsemane, trial, crucifixion, death and resurrection (xxvi, 1-xxviii, 20). In addition to the story of events and many brief reports of sayings of Jesus, this Gospel is marked by a cycle of five long discourses, each followed by a uniform formula, "It came to pass when Jesus finished." These discourses are "The Sermon on the Mount" (v, 1–vii, 27); the "Address to the Apostles" (x, 5–42); the collection of "Kingdom Parables" (xiii, 1–52); the "Discourse on Humility and Forgiveness" (xviii, 1–35); and the "Apocalyptic Discourse" (xxiv, 4–xxv, 46). While it need not be doubted that Jesus spoke at length on each of the occasions with which these discourses are connected, it is commonly held, especially in view of the somewhat parallel reports in Luke, that the author has gathered sayings spoken at various times and grouped them into what may be called "bouquets" of discourse, uniting them, not on the ground that all were spoken on the same occasion, but rather according to a logical association of ideas. This Gospel is also characterized by an arrangement of material in groups of threes, fives or sevens, presumably to aid the memory. Some 40 triplets have been named, e.g., the genealogy is arranged in three groups of 14 generations each, in chapters viii and ix there are three miracles of power, followed by three of restoration, there are given three prayers in Gethsemane, etc. Groupings by five and seven are not so common but occur often enough to deserve note as a striking characteristic of this book.

Purpose.— The purpose of the author plainly was to confirm Jewish Christians in their belief that Jesus of Nazareth was the Messiah long foretold by the prophets and expected by his nation. This is strikingly shown by the many references to the Old Testament which is cited no less than 40 times, often with the formal statement "that it might be fulfilled." The frequent use of the title "Son of David," as well as the genealogy which is traced back to Abraham through the royal line of David, the declaration in the Sermon on the Mount of his right to legislate parallel to the original gift of the Divine law through Moses, the assertion that the kingdom would be taken from the Jews and given to others and the grief over Jerusalem, the picture of himself as the judge at the Final Judgment, these claims in addition to the claims of Messiahship found in the other Gospels and culminating in the declaration of the Risen Christ that all authority in heaven and earth alike is his, all this abundantly proves that the object of the author was to show that Jesus of Nazareth was the promised Messiah and that all the Divine promises were to be fulfilled, not for the nation at large which had rejected him, but for his followers, because they had accepted him.

Sources.— Careful comparison of the first Gospel with the second shows that the order of events is substantially the same in both and that almost every paragraph of Mark is reproduced in Matthew, the exceptions being only seven brief paragraphs of at most less than 35 verses. As the theory that Mark is an abbreviation of Matthew has proved untenable, it follows that Matthew must be in some way dependent on the material of Mark: the resemblance is too close to permit the supposition that both drew from some independent document. But while the source of Matthew must have corresponded in general very closely to the present form of our Mark, yet this contains so much of picturesque detail which is not reproduced in Matthew that it cannot reasonably be held that Mark as we now have it was the source in question. How to account for this difference is still a problem of criticism. It is generally held that there may also be traced in Matthew a second main source, sometimes called the "Logia" document, sometimes "Q." (See article GOSPELS). In addition, there is some material which cannot reasonably be traced to either of the two main sources, as the genealogy and the infancy narratives, but it is impossible now to trace the origin and extent of these special sources. This fact need not, however, impair our sense of their trustworthiness. It may also be noted that it is not reasonable to hold that the author of this book was a mere copyist who kept slavishly to the exact form of any written sources which lay before him.

Authorship.— The author of this Gospel for Jewish readers must of course have been himself of Jewish descent. Nor is his use of the

Greek language inconsistent with this, since the use of Greek was so widespread that in the 1st century Palestine must have been largely bilingual. That he was a Palestinian Jew is manifest from the whole tone of his work. The tone of his work is also such as to make it doubtful whether the author of the book as it now stands was himself an associate of Jesus in his ministry. While much of the material must go back to eyewitnesses, the author himself seems more remote. Accordingly the difficulty in the way of accepting the early and uniform tradition that the Apostle Matthew was the responsible author is increasingly felt. It is also generally recognized that the book does not have the unavoidable marks of being a translation, but shows that it must have been originally composed in Greek, while the early tradition was that Matthew composed his work in the "Hebrew language," by which of course the Aramaic was meant, which had long before replaced Hebrew in common use. It will retain the substantial value of the tradition if it is held that Matthew was the author of "Q." When the Marcan source was reworked to include the collection of discourses and other material which was due to Matthew, it would not be surprising to find his name attached to the whole work. Accordingly, while the direct authorship by Matthew of the book in its present form is still very commonly held, there is a perhaps increasing tendency among critics to connect only the "Logia" document with the Apostle himself.

Date and Place of Composition.— There is little dissent at present from the view that this Gospel was composed late in the seventh decade of the 1st century, presumably 65–68. As to the place of composition there is less agreement. The material is Palestinian, but many feel a certain sense of detachment as if the author was not when he wrote amid the scenes which he describes. Of course this might be true if written in some place in Palestine remote from both Capernaum and Jerusalem; some Syrian city has been suggested, and even Alexandria has been thought not too remote, especially in view of its large Jewish and Jewish-Christian population.

Authenticity and Value.— If the common view of Matthew's direct authorship is still to be accepted, then this Gospel as the work of an apostolic associate of Jesus must be trustworthy and valuable in the highest degree. If, on the other hand, the book is referred to an unnamed author who worked mainly on the basis of the Marcan and Logia documents, its trustworthiness and value will be impaired less than might at first be supposed. We must assume the honesty of the compiler and editor, which indeed is everywhere manifest, and according to the theory he was working on documents which embodied the common Christian tradition approved by the many disciples who had seen Jesus face to face or which even had full apostolic authority. Such were presumably the Marcan source and most probably the Matthæan Logia, while the genealogy could have been drawn from public sources, and the tone of the infancy narratives is such as conclusively to guarantee their very early date. When all these facts are taken into account, it will appear that the latest criticism really confirms the often quoted saying of Renan: "The Gospel of Matthew, all things considered, is the most important book of Christianity — the most important book that has ever been written."

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MATTHEW TOWN. See INAGUA, GREAT.

MATTHEWS, (James) Brander, American author: b. New Orleans, La., 21 Feb. 1852. He was graduated from Columbia in 1871 and from the Columbia Law School in 1873, he was admitted to the New York bar (1873), began to contribute to the magazines in 1873, later turned wholly to literature and in 1892 was appointed professor of literature in Columbia. In 1899 he became professor of dramatic literature. He was a founder of The Players and Authors clubs, of the Dunlap Society and the American Copyright League, and of the Columbia University Press. In 1889–91 he was president of the 19th Century Club. He was appointed to French Legion of Honor in 1907. Elected to American Academy of Arts in 1908. President of Modern Language Association in 1910 and of National Institute of Arts and Letters in 1913–14. He wrote several dramatic works, among them 'This Picture and That'; 'A Gold Mine' (with G. H. Jessop); 'On Probation' (also with Jessop); and 'Peter Stuyvesant' (with Bronson Howard). His published volumes include, from an extensive list, the following: 'French Dramatists of the Nineteenth Century' (1881); 'In Partnership' (with H. C. Bunner, 1884); 'A Secret of the Sea, and Other Stories' (1886); 'Pen and Ink' (1888); 'American Literature' (1896); 'A Confident To-morrow' (1898); 'The Action and the Word' (1900); 'Parts of Speech: Essays in English' (1901); 'The Development of the Drama' (1902); 'Molière: His Life and His Works' (1910); 'Shakspere as a Playwright' (1913); 'On Acting' (1914); 'The Oxford Book of American Essays' (1914). He is perhaps best known for his critical papers, marked by keen analysis and a style of much distinction. Some of his earlier writings appeared over the signature "Arthur Penn."

MATTHEWS, Edmund Orville, American naval officer: b. Baltimore, 24 Oct. 1836; d. 30 Jan. 1911. He was graduated from the United States Naval Academy in 1855 and served in the navy before the outbreak of the Civil War, in which he served with distinction. In 1869–73 he was in command of the torpedo boat corps at Goat Island, Newport Harbor, and he commanded the *Brooklyn* in the Asiatic squadron in 1885–87; he was a member of the Board of Inspection and Survey in 1891–94 and in 1897 was raised to the rank of rear-admiral. He was appointed president of the Examining Board in 1898 and served until he was retired in that year.

MATTHEWS, Franklin, American journalist: b. Saint Joseph, Mich., 14 May 1858.

He was graduated from Cornell University in 1883, was reporter and editor on the Philadelphia *Press*, 1886–90, reporter, editor, correspondent of the New York *Sun*, 1890–1912. He was assistant Sunday editor and night city editor of the New York *Times*, 1912–15. He is now associate professor of journalism, Columbia University, 1914. He is a trustee of Cornell University, 1913–18, and also president of the Cornellian Council, 1915. He has published 'Our Navy in Time of War' (1899); 'The Newborn Cuba' (1899); 'With the Battle Fleet' (1909); 'Back to Hampton Roads' (1909).

MATTHEWS, John Hobson, English archivist: b. Croydon, near London, 1858; d. Ealing, 23 Jan. 1914. He was educated at the Proprietary School of Blackheath and at The Leys, Cambridge. In 1877 he entered the Roman Catholic Church and two years later was made a solicitor. From 1894 to 1903 he was employed as archivist to the corporation of Cardiff, Wales, and was also archivist to the county and urban councils of Monmouthshire. His various avocations included those of expert archivist, record searcher, genealogist, journalist and legal antiquary. In 1895 he discovered the text of the grant of Cardiff lands to Sir William Herbert, in 1550, the document being almost illegible. In the following year he brought to light the text of a charter to the borough of Newport. In 1903 and 1911 he was called as expert before the Royal Historical Manuscripts Commission. He published 'History of St. Ives, Cornwall'; 'History of the Hundred of Wormelow'; 'The Vaughans of Courtfield'; 'The Old Faith and the New'; 'Life and Memorials of St. Teilo'; 'The Mass and its Folklore'; 'Continuity Reconsidered.' He continued Duncumb's 'Herefordshire,' edited 'Cardiff Records' (1898–1905) and contributed to 'The Catholic Encyclopedia,' the *Tablet, Athenæum,* etc.

MATTHEWS, Marmaduke Matthews, Canadian artist: b. Warwickshire, England, 1839; d. 1913. He received his education in Oxford and London; removed to Toronto in 1860 and resided in New York from 1864 to 1869. In the latter year he returned to Toronto, was one of the founders of the Ontario Society of Artists, of which he was president in 1894. He excelled in woodland studies. His best-known works are 'The Canadian Wonderland' and 'The Conquered Portal.'

MATTHEWS, Paul, American Protestant clergyman: b. Glendale, Ohio, 25 Dec. 1866. In 1887 he was graduated at Princeton University and three years later at the General Theological Seminary, New York. In 1891 he was ordained to the ministry of the Protestant Episcopal Church; served as assistant at the church of the Advent, Walnut Hills, Cincinnati, 1890–91; entered the Associate Mission, Omaha, and had charge of Saint Paul's and Saint John's churches in 1891–95. From 1896 to 1904 Dr. Matthews was rector of Saint Luke's, Cincinnati, and from 1904 to 1913 was dean of Saint Paul's Cathedral of the same city. In 1913–15 he was dean of the cathedral at Faribault, Minn., and professor at Seabury Divinity School. On 25 Jan. 1915 he was consecrated bishop of New Jersey.

MATTHEWS, Stanley, American jurist: b. Cincinnati, Ohio, 21 July 1824; d. Washington, D. C., 22 March 1889. He was graduated from Kenyon College in 1840, studied law and was admitted to the bar in 1842, when he established a practice in Maury County, Tenn., but returned to Cincinnati in 1844 and engaged in practice there. He was editor of the Cincinnati *Herald,* an anti-slavery journal, in 1846–49, and held various political offices, and in 1855–56 was a State senator. In 1858 he was appointed United States district attorney for the southern district of Ohio, but at the outbreak of the Civil War in 1861 entered the volunteer service and was commissioned lieutenant-colonel and was a colonel when in 1863 he resigned to accept the seat of judge of the Superior Court of Cincinnati. He was elected United States senator in 1877 after having acted as counsel before the Electoral Commission, and in 1881 he was appointed a justice of the Supreme Court of the United States.

MATTHEWS, Washington, American physician and ethnologist: b. Killiney, Dublin County, Ireland, 1843; d. 1905. In 1864 he was graduated at the medical school of the University of Iowa. He was commissioned assistant surgeon in the United States army, from which he retired as surgeon in 1895. He made several anthropological studies of the Indians of North America. His published works include 'Dictionary of the Language of the Hidatsa' (1873); 'Navaho Silversmiths' (1883); 'Navaho Weavers' (1884); 'The Mountain Chant, a Navaho Ceremony' (1887); 'Navaho Legends' (1897); 'The Mystic Chant, a Navaho Ceremony' (1902); 'Navaho Myths, Prayers and Songs' (1907).

MATTHIAS, mą-thī'ąs, a disciple of Jesus, probably one of the 70, who was chosen by lot to take Judas Iscariot's place among the 12. Little is known of him. Even early legend confused him with Matthew, and an apocryphal gospel was attributed to him. In the Roman Catholic Church 24 February, in the Greek 9 August, is sacred to him. The 'Acts of Andrew and Matthias' make him a missionary in Africa. Consult Eusebiús, 'Ecclesiastical History' (Vol. I, 12; II, 1).

MATTHIAS (Ger. mät-tē'ās), emperor of Germany: b. Vienna, 24 Feb. 1557; d. 20 March 1619. He was a younger son of Maximilian II. He was made governor of Austria in 1593 and two years later became heir to the imperial throne. He fought in the war against the Turks and in 1606 was made head of the House of Hapsburg. He became king of Bohemia in 1611 and had annexed Hungary and Moravia before the death of Rudolf II. In 1612–19 he was emperor of the Holy Roman Empire, having been elected on the death of his brother, Rudolf II (q.v.). His reign was an unsuccessful one owing to the religious dissensions among the constituent parts of his empire. He attempted in vain to suppress by decree the Catholic League and Protestant Union. Consult Gindely, A., 'Rudolf II und seine Zeit' (Prague 1868) and Heling, J., 'Die Wahl des römischen Königs Matthias' (Belgrade 1892).

MATTHIAS I, Hunyadi ("Corvinus"), kŏr-vē'noos, THE GREAT, king of Hungary: b. Klausenburg, Transylvania, 23 Feb. 1440; d.

Vienna, 4 April 1490. The second son of John Hunyady, he was imprisoned in Bohemia by his father's enemies, who strongly but unsuccessfully opposed his candidacy for the crown of Hungary in 1458. Another party of opposition attempted to make the Emperor Frederick III king of Hungary; but Matthias brought them to terms and in 1463 made peace with Frederick. By the Peace of Olmütz, 22 July 1479, he gained Silesia, Moravia and Lausitz, and the succession to the crown of Bohemia. In his wars with the Turks he was equally successful and a part of Bosnia was ceded to him by the Porte. War broke out again with the Austrian emperor; Matthias invaded his territory and captured and held Vienna. His court was a centre of scholarly men and his library, called the Corvina, a famous collection. The internal administration of Hungary was greatly improved under Matthias. Consult Fraknói, Vilmós, 'King Matthias Hunyadi' (Budapest 1890; German trans., Freiburg 1891) and Galeotti, Marzio, 'De egregie sapienter et jocose dictis ac factis Matthiæ regis' (Vienna 1746).

MATTING. While this term is usually employed to designate floor coverings made from reeds and fibrous grasses, it is a generic term which includes not only the commercial mattings for house floors, which are made in Eastern countries, but a much wider range of articles useful in the domestic economy and in other employments, such as screens and tatties, sleeping mats (used in India and the East), the matting employed by nurserymen for protecting hotbeds and cold frames, and even some forms of thatch. For the most part mattings are hand-woven, in the finer varieties the warp being cotton or other yarns and the filling the culms of various sedges, reeds and grasses, an example being the familiar Japanese mattings of the house-furnishing stores. In the Russian bast mattings for nurserymen's use, bast of the linden tree is employed for both warp and filling, very coarsely woven or plaited. The roots of the Khus-Khus (*Andropogon squarrosus*), a perennial grass of India, are woven into fragrant screens for open windows and also made into awnings. The Taika rush mats of Formosa are famous as sleeping mats, and the best grades are said to be as fine and soft as cloth, resembling the best Panama hat weaving. Consul Davidson states that a mat of the highest grade, measuring 5 x 6 feet, requires the labor of a girl weaver 120 days, and such mats have sold for 60 to 70 yen (or about $40). The rush is an unidentified species, but sleeping mats are made from several species of *Cyperus* and *Scirpus* found in Asia, Africa and other countries.

The commercial mattings used for house decorations are for the most part of Chinese and Japanese manufacture. In Japan two species are employed, *Juncus effusus*, the Bingo-i mat rush, which is always manufactured into the costly mats used by the higher classes (and known as Tatamiomote) and *Cyperus unitans*, which is employed for the cheaper grades. The largest importer of these mats is the United States, England, Austria and Germany, following in the order named. The qualities of the Bingo-i are named as follows: Kinkwanyen, manufactured at Okayama; first quality Aya-mushiro, second quality Aya-mushiro, Damask Aya-mushiro, common Aya-mushiro, manufactured at Bittiro. First quality Somewake-mushiro, common Somewake-mushiro, Damask Hana-mushiro, common Hana-mushiro, manufactured at Bingo; ordinary Hana-mushiro (best quality), manufactured at Chikugo. *Cyperus unitans* produces the Shichito-i mats which are chiefly manufactured in the Oita prefecture. The plant is cultivated both upon upland and irrigated lands. The varieties of mats from this species are known by names as follows: Kikaiori Hana-mushiro, Damask Hana-mushiro, common Hana-mushiro (two forms). Seidaka Hana-mushiro, manufactured at Bungo. Mattings made from the two species above have been exported in a single year to the value of 650,000 yen, or over $400,000.

The Chinese and Korean mat rush is *Cyperus tegetiformis*, this species also being used for the manufacture of cuffs and sandals. The India commercial mattings are made chiefly from *Cyperus corymbosus* and *tegetum;* the latter being known as the Calcutta mat rush, while the former is used for the Tinnerelly mats which are the finest made in India. They are also made at Palghat, but these are not so fine. In the manufacture of the India mattings the culms are split into two or three parts and then woven into mats upon a warp of threads previously stretched across the floor of a room. The operator passes the culms with the hand alternately over and under the successive threads of the warp and presses them home.

It would be difficult to enumerate all of the mattings made in different countries, though mention should be made of the fine and highly prized Niihau mats of Hawaii, produced from *Cyperus levigatus*. Matting is made in Spain and Morocco from *Juncus maritimus*, and in Italy from *Juncus acutus*. Two species of sword rush, *Lepidosperma gladiatum* and *L. flexuosum*, are used by the natives of Australia not only for mats, but for baskets and other articles, and *Lepironica mucronata*, found in Asia, Africa and Polynesia, supplies the fibre for the mats with which Chinese boatmen cover their cargoes.

In the United States, a handsome and utilitarian form of floor matting is largely manufactured from Slough grass, *Carex filiformis*. In normal years the imports of mattings to the United States reach a total of $3,250,000.

The University of California has recently been experimenting with several species of matting rushes, chiefly *Juncus effusus*, and *J. robustus*, from which a fine sample of matting has been manufactured at a factory in Maine. There is a possibility therefore that rush matting may be produced in the United States, commercially, in the near future.

For matting fibres consult 'Dictionary Economic Products of India,' 'Descriptive Catalogue of Useful Fiber Plants of the World,' and 'The Island of Formosa,' by Jas. W. Davidson. Consult also 'History and Manufacture of Floor Coverings' (New York 1898). The leaves of many species of palm, in different parts of the world, are used for native mats and mattings, though few of these ever reach commercial importance. See PALMS.

CHARLES RICHARDS DODGE.

MATTING FIBRES. See FIBRE.

MATTIPI, or **FROG SNAKE,** serpent (*Xenodon severus*) of northeastern South America. While a poisonous variety, it is slow to bite. Its posterior teeth serve as fangs, but it has no venom sacks. The bite causes temporary swelling and soreness, but is seldom fatal.

MATTISON, Hiram, American Methodist Episcopal clergyman: b. Norway, Herkimer County, N. Y., 1811; d. 1868. After holding pastorates at Watertown and Rome, N. Y., he became pastor of the John Street Church, New York, in 1852. Subsequently he was made pastor of Trinity Methodist Episcopal Church in the same city. In the General Conference of 1860 Mattison tried to have action taken against all slave-holding members in the Church, and piqued at his failure he withdrew from the Church in 1861 and was made pastor of Saint John's Independent Methodist Church. Four years later he returned to his old denomination and was appointed to the pastorate of Trinity Methodist Episcopal Church, Jersey City. In 1868 Mr. Mattison was district secretary of the American and Foreign Christian Union. His published works include 'Tracts for the Times' (1843); an edition of Burritt's 'Geography of the Heavens' (1850); 'Spirit-Rapping Unveiled' (1854); 'Sacred Melodies' (1859); 'Impending Crisis' (1859); 'Immortality of the Soul' (1866); 'Resurrection of the Body' (1866); 'Defense of American Methodism' (1866); 'Popular Amusements' (1867). Consult Vansant, 'Life of Hiram Mattison' (New York 1870).

MATTO GROSSO, mä'tō grō'sō, Brazil, a western central state bordering on Bolivia and Paraguay. It has an area of 532,683 square miles and an estimated population in 1917 of only 142,000 or 143,000, of whom 30,000 were in or near Corumbá (q.v.) and 20,000 were citizens of the capital, Cuyabá (q.v.). It appears, therefore, that in this vast political division of Brazil there is an average of only one person to each three and two-thirds square miles, the estimates being based upon those given in the Pan-American Union handbook 'Brazil.' The only Brazilian state exceeding this in size is Amazonas (q.v.). The best recent descriptions of a portion of the interior from Paraguay up to the Amazon River are in the following books: Roosevelt, T., 'Through the Brazilian Wilderness' (New York 1914); Zahn, J. A. (H. J. Mozans), 'Through South America's Southland' (New York and London 1916). The ex-President writes (p. 100): "It is certain that this inland region of Brazil, including the state of Matto Grosso, which we were traversing, is a healthy region, excellently adapted to settlement; railroads will speedily penetrate it, and then it will witness an astonishing development."

MATTOON, mą-toon', Ill., city, in Coles County, on the Illinois Central and the Cleveland, Cincinnati, Chicago and Saint Louis railroads, about 75 miles east by south of Springfield. It was settled and incorporated in the year 1855. It is situated in an agricultural region in which broom corn is one of the principal products. Grain, fruit and livestock are also produced in large quantities. The chief manufacturing establishments are broom factories, flour mills, grain elevators, wagon and carriage factories, brick and tile yards, foundries, machine shops and repair shops for several railroads. It has a large trade in its manufactured articles, grain, fruit and livestock. Some of the prominent buildings are the Old Folks' Home (I. O. O. F.), the public and parish schools, the public library and reading-room and the churches. The electric-light plant is owned and operated by the city. The government is vested in a mayor, chosen for two years, and a council. Pop. 12,218.

MATURIN, Charles Robert, Irish dramatist and novelist: b. Dublin, 1782; d. 30 Oct. 1824. He received his education at Trinity College, Dublin, entered the ministry of the Church of Ireland and served successively as curate at Loughrea, County Galway, and at Saint Peter's, Dublin. He wrote the novels 'The Fatal Revenge; or, the Family of Montorio' (1807); 'The Wild Irish Boy' (1808); 'The Milesian Chief' (1812), under the pseudonym of "Dennis Jasper Murphy." The novels were ridiculed by the critics, but attracted favorable attention from Sir Walter Scott, who introduced Maturin to Lord Byron. These powerful friends secured the production of Maturin's tragedy 'Bertram' at Drury Lane in 1816, with Kean in the leading rôle. It ran for 22 nights, and a French version was produced soon afterward at the Théâtre Favart, Paris. His other tragedies 'Manuel' (1817) and 'Fredolfo' (1819) failed totally. Among his other works were the novels 'Women' (1818); 'Melmoth the Wanderer' (1820), and 'The Albigenses' (1824). 'Melmoth' is his greatest work and was most successful in its day. Balzac wrote a sequel to it entitled 'Melmoth Reconciled to the Church' (1835). Consult 'Melmoth,' edited with memoir of the author and bibliography (London 1892).

MATURIN, mä-too-rēn', Venezuela, a town in the state of Monagas, formerly the capital of the state of Maturin. It is on the Guarapiche branch of the Orinoco Delta, 25 miles by rail above its port, Colorado, and 40 miles from the sea. A considerable trade with the West Indies, principally in cattle and hides, is carried on. In the neighborhood are extensive plantations of cacao, sugar cane, fruits and cereals. Its industrial establishments turn out cigars, hammocks, boots, shoes and soaps. Pop. 4,400.

MATZOON, a milk food used in Armenia; prepared by exposing milk in open vessels to a heat of 90° F., and when coagulation takes place the curd is broken up by a churning process and a little salt is added. See KUMISS.

MATZOTH, the Hebrew name for a kind of unleavened bread or biscuit eaten by the Jews during the feast of the Passover.

MAUBEUGE, mo'bezh, France, fortress and manufacturing town in the department du Nord, occupying both banks of the Sambre, 140 miles by rail northeast from Paris, within two miles of the Belgian frontier. The origin of Maubeuge was in a double monastery for monks and nuns founded in the 7th century. Destroyed successively by the Normans, by Louis XI, by Francis I and by Henry II, it finally fell to France by the Treaty of Nimeguen in 1678, and was fortified by Vauban. Pre-

vious to 1914 it was defended by nine forts. Besides its arsenal and several old convents Maubeuge has a variety of important industries, as iron foundries, tanneries and manufactories of firearms and iron and steel goods. It has also an active trade in coal, marble, slate, saltpetre, sugar and oil. In the Great War of 1914–18 Maubeuge and its forts held out almost a month against a heavy bombardment from German siege artillery. On 9 Sept. 1914 the Germans claimed the capture of the town, but the French on the 11th denied that it had fallen. On 18 September it became known that the town and forts had definitely fallen to the Germans. Pop. 23,200.

MAUCH CHUNK, mâk chŭnk, Pa., a town and county-seat of Carbon County, on the Lehigh River, the Lehigh Coal and Navigation Company's Canal and on the Central of New Jersey and the Lehigh Valley railroads, 46 miles west by north of Easton. The town is picturesquely built on the side of a mountain rising 1,500 feet from the river, here winding through a narrow, deep ravine, and each summer is visited by thousands of tourists, attracted by the beauty of the surrounding natural scenery. The town has a county building, Young Men's Christian Association building, the Dimmick Memorial Library, the Asa Parker Park, is electrically lighted and has electric street railways. It has a number of foundries, shoe factories, car shops, silk mills, etc., but is best known as an important coal centre, marking the extreme boundary of the anthracite coal region of Pennsylvania; it was established by the Lehigh Coal and Navigation Company in 1818. The Summit Hill coal mines, nine miles southwest of the town, are among the best in the State. The coal is now carried through a tunnel, but was formerly transported to Mauch Chunk by a gravity railroad known as the Switchback, which has became famous as an exciting pleasure route for tourists. Mounts Pisgah and Jefferson, the summits of which are reached by the Switchback railroad; Prospect Rock, Flagstaff Peak and Glen Onoko are points of considerable interest, commanding splendid views of the Lehigh Valley. The government is vested in a burgess and council, elected for terms of four years. Pop. 4,400.

MAUD. Tennyson called 'Maud' a "monodrama," a drama told in a series of lyric soliloquies. His explanation of its unique form is this: "The peculiarity of this poem is that different phases of passion in one person take the place of different characters." To tell the story of 'Maud' is to follow these phases of passion. The beginning shows the hero cut off from life by his heritage of hate and wrong, crying for war to kill the greed and cruelty of peace. With the coming of Maud, the child of his enemies, begins his new life of love that embraces mankind. His joy is shattered at its climax; a hopeless exile, he seeks only escape from the phantoms of the past. From this death in life, he is saved by the outbreak of war "in defence of the right." The ending, written to the sound of cannon booming from British battleships before the Crimean War, is a pæan of battle. It was this militant strain in 'Maud' that shocked Tennyson's admirers and still provokes criticism. Yet read, not as a defence of any one war, but as an indictment of the materialistic peace that is war and that causes war, the poem shows something of that larger vision that is prophetic.

As a monodrama, 'Maud' fails to achieve dramatic unity. Many of the separate lyrics are genuine bits of inner action, of soul-drama, set forth with keen psychological analysis, with skilful variation of meter to express fluctuation of feeling. But sequence of action, the law of drama, is sacrificed to singleness of mood, the essence of the lyric. In 'Maud,' as in 'The Princess,' Tennyson's attempt to fuse the lyric and the dramatic moods fails. To think of 'Maud' is to think first of those songs that have become part of the vocabulary of passion and of longing. Consult Tennyson, Hallam, 'Alfred, Lord Tennyson: a Memoir' (2 vols., 1897); Grierson, H. (in 'Cambridge History of English Literature,' Vol. XIII, ch. 2, and bibliography).

FRANCES W. CUTLER.

MAUD MULLER, a poem by J. G. Whittier, first published in the *National Era,* December 1854. It is a ballad reciting a romantic passage in the lives of a susceptible judge and a country girl.

MAUDE, SIR **Stanley,** English soldier, commander of the British Expeditionary Force in Mesopotamia 1916–17. He was born in 1864, entered the army at the age of 20 and saw his first active service in the Egyptian campaign of 1885. He fought in several battles in the South African war and later served as military secretary to the governor-general of Canada, 1901–04. He next became private secretary to the Minister for War in London, and was subsequently connected with the organization of the newly-formed Territorial Army. He was on the General Staff of the 5th Division when the European War broke out, and took part in all the early operations of the campaign. While in command of the 14th Infantry Brigade he was severely wounded. On his recovery he was promoted major-general in 1915, and transferred to the Dardanelles, thence to Egypt and afterward to Mesopotamia, where he took over the chief command in succession to General Sir Percy Lake in August 1916. The military situation in that theatre of war was critical. On 29 April General Townshend had been forced to surrender at Kut with 8,000 men owing to lack of resources. It was the task of General Maude to retrieve the disaster. After some months of preparation and reorganization he marched out with all his forces in December and pushed right up to Kut, where the Turks were strongly entrenched on both banks of the Tigris. With hard fighting he dislodged the enemy, drove him back into Kut, and launched his main attack across the river at Shumran. The Turks broke and fled; Kut fell again to the British, and Maude pursued with such vigor that he entered Bagdad on 11 March 1917. Another long period of preparation followed, and on 28 Sept. 1917 General Maude attacked the Turks at Ramadie, carried the advanced positions and encircled them with his cavalry, compelling the whole division to surrender. On 6 November he captured Tekrit, the riverhead on the Tigris, and the whole of the Turkish forces withdrew from 30 to 50

miles northward. Before he was able to achieve anything further, General Maude died, after a very brief sickness, at Bagdad on 18 Nov. 1917.

MAUDSLEY, mâdz'li, **Henry,** English alienist: b. near Settle, Yorkshire, 6 Feb. 1835; d. 23 Jan. 1918. He was graduated in medicine from the University of London in 1857, was editor of the *Journal of Mental Science* in 1862–78, in 1869–79 was professor of medical jurisprudence in University College, London. In 1913 he presented $150,000 to the London County Council for the erection of a Maudsley Hospital for the Insane. His works include 'Responsibility in Mental Disease' (1874); 'Physiology of Mind' (1876); 'Pathology of Mind' (1879); 'Natural Causes and Supernatural Seemings' (1886); 'Life in Mind and Conduct' (1902); 'Heredity, Variation and Genius' (1908).

MAULE, mow'lā, Chile, a maritime province bounded north by the province of Talcá, east by Linares and Nuble, south by Concepción and west by the Pacific Ocean. Area, 2,812 square miles. It takes its name from its principal river. The well-wooded Coast Range, nearly 3,000 feet high, occupies the great portion of the surface. Agriculture and its allied occupations constitute the principal industries. Cattle, hides, wheat and lumber are exported. The Maule and Stata are navigable and afford good means of communication. There is a branch of the government railroad from Cauquenes to Parral. Another line connects Constitución with Talcá. Capital, Cauquenes (9,895); chief port, Constitución. Pop. of province 122,754.

MAULE, Chile, a river rising in the Andes and after a westerly course of about 150 miles, 52 of which are navigable for small vessels, flowing into the Pacific Ocean near the village of Constitución, 99 miles northeast of Concepcion. The Maule River is supposed to have been the southern boundary of the empire of the Incas. In its upper courses its waters supply extensive irrigation systems.

MAULMAIN, mâl-mān', or **MOULMEIN,** mowl-mīn', Burma, the capital of the Tenasserim division, and a seaport near the mouth of the Salwin River, on the Gulf of Martaban 30 miles from the Bay of Bengal. The town, comparatively modern, dating from 1826, is regularly built on level ground between the river and a range of wooded hills, on whose heights are the gilded spires of numerous pagodas and elegant residences, commanding fine views of beautiful scenery. Maulmain has numerous public buildings, churches, chapels and missionary establishments, several charitable and educational institutions, barracks, a hospital, jail, etc. A considerable trade is carried on with Indian ports, the chief exports being teak-wood and rice, cotton, hides, horns, gums, ivory, copper, lead, wax, the imports, piece goods, hardware, provisions and general merchandise. Shipbuilding is a thriving industry because of the available supply of teakwood. The water supply system, gas plant and sewage system are the property of the municipality. Pop. about 60,000, besides native Burmese, comprising Hindus, Eurasians, Armenians, Chinese, Malays, Jews and Europeans.

MAUMEE, mâ-mē', a river formed by the junction of Saint Mary's and Saint Joseph's rivers at Fort Wayne, Ind. It flows northeast across the northwest corner of the State of Ohio, and enters Lake Erie through Maumee Bay. Its affluents are the Auglaize and the Tiffin. Its basin is 6,700 square miles in extent. The river is 150 miles long and navigable 12 miles from its mouth to the Maumee Rapids. The Miami and Erie Canal, which connects Lake Erie with the Ohio River, begins at the head of navigation on the Maumee, and follows the course of the river to Defiance, then turns south. The Maumee Bay, a shallow body of water, has been improved by deepening and straightening the channel. Toledo is at the mouth of the Maumee. The Maumee River was a part of one of the water routes much used by the early missionaries and explorers. The distance from the head waters of the Maumee to the Wabash River is only about 25 miles.

MAUNA KEA, mow'nā kā'ā, Hawaii, an extinct volcano, the highest peak in the Pacific, 13,805 feet in altitude. Snow covers its upper slopes for the greater part of the year, and its sides are wooded. Coffee is cultivated on the lower slopes. See HAWAII.

MAUNA LOA, mow'nā lō'ā, Hawaii, a volcano 13,760 feet high, with a crater nearly five miles in circumference, and vertical precipices on the inner side 500 to 600 feet high. Mauna Loa is situated in the central southern portion of Hawaii, and on its eastern slope is the still larger crater of Kilauea, about nine miles in circumference, but apparently having no communication with Mauna Loa, their periods of activity being independent of each other. Mauna Loa's last period of great activity was in 1881. See HAWAII; KILAUEA.

MAUNDY (mân'di) THURSDAY, is the Thursday in the Passion week. Another popular old name of the day is Shere Thursday, from the custom of shearing the hair which the priesthood used to observe. It used to be the custom in England and other countries, and still is in Austria, for the sovereign to wash the feet of a certain number of poor persons, and to send them away with presents in the shape of food, clothing and money. This ceremony is in commemoration of the act of Christ, who washed his apostles' feet on the occasion of the last supper.

MAUNOURY, Michel Joseph, French soldier: b. Maintenon, Eure-et-Loir, 17 Dec. 1847. He received his education at the École Polytechnique, Paris; first saw active service as second lieutenant in the Franco-Prussian War of 1870–71. In that conflict he was wounded at Champigny. His professional studies were pursued at the École Supérieure de Guerre. From 1886 to 1888 Maunoury was artillery instructor at the famous military academy of Saint-Cyr. In 1897 he attained the rank of colonel, was made brigadier-general four years later and a general of division in 1905. In 1905 he had charge of the artillery of the Paris forts and soon after was made president of the commission of military schools. General Maunoury was commandant of the École Supérieure de Guerre in 1907; the following year of the 15th Army corps with headquarters at Marseilles, and in 1909 of the 20th corps at Nancy.

He was made military governor of Paris in 1910 and a member of the Superior Council of War. In the War of 1914–18 Maunoury was placed in charge of the army of manœuver and was rushed north in an effort to turn the flank of Von Kluck's army then driving toward Paris. When the latter discovered Maunoury on his right the drive was stopped and in the battle of the Marne the invader was driven back. Subsequently after the beginning of trench warfare Maunoury held a command at Soissons. He was severely wounded in March 1915 and in the same year received at the hands of the President of the Republic the *médaille militaire*, the highest military honor in the gift of France. He is also an officer of the Legion of Honor. In November 1915 Maunoury succeeded Gallieni as military governor of Paris. Consult Blanchon, G., 'Le général Maunoury' (Paris 1916). See WAR, EUROPEAN.

MAUPASSANT, Henri René Albert Guy de, ŏñ-rē rė-nā äl-bār gē dė mō-pä-säñ, French novelist: b. Chateau Miromesnil, Seine-Inferieure, France, 5 Aug. 1850; d. Paris, 6 July 1893. He began his career as a clerk in the Navy Department in Paris and also served for a time in the French army during the Franco-Prussian War. The novelist Flaubert, a friend of his mother's, was his godfather, and the youth took him as his model in the art of composition. After years of practice, during which he wrote and destroyed a great number of manuscripts, he allowed a short story, 'Boule de Suif,' to appear in 1880, a work which displayed the greatest finish and at the same time allied him to the naturalistic school of fiction. In the same year he published a book of verse, 'Des Vers,' and a drama, 'Histoire du vieux Temps.' After this he continued to cultivate the short story and was very soon recognized as one of the greatest writers of short stories the 19th century had seen. In spite of the perfection of art displayed in their construction neither his brief tales nor his novels form pleasant reading. They compel admiration, but they are dominated by pessimism and in his later work the traces of an unbalanced mind may be plainly seen. In 1890 De Maupassant's mental malady occasioned the cessation of literary occupation, two years later he became wholly insane and he died the next year in an asylum. His collections of short stories include 'La Maison Tellier' (1881); 'Mlle. Fifi' (1883); 'Les Sœurs Rondoli' (1884); 'Yvette' (1884); 'Contes du Jour et de la Nuit' (1885); 'Contes et Nouvelles' (1885); 'La Horla' (1887); 'La petite Roque' (1888); 'La Main gauche' (1889); 'Le Père Milon'; 'L'inutile Beauté' (1890), etc. The finest of his six novels is 'Pierre et Jean' (1888); the others are 'Une Vie' (1883; 'Bel Ami' (1885); 'Mont Oriol' (1887); 'Fort comme la Mort' (1889); 'Notre Cœur' (1890). He also published several collections of travel sketches, such as 'Au Soleil' (1884); 'Sur l'Eau' (1888); 'La Vie errante' (1890). A collection of 13 of his short stories published in English with the title, 'The Odd Number,' represents him at his best, both in point of art and as regards the stories themselves. The absence of a moral sense is less apparent here than elsewhere and there is less of gloom and animalism perceptible. Consult 'Œuvres complètes de Guy de Maupassant' (29 vols., Paris 1908–10); 'Works of Guy de Maupassant' (9 vols., New York 1910); Brunetière, Ferdinand, 'Le roman naturaliste' (Paris 1883); Doumic, René, 'Ecrivains d'aujourd'hui' (ib. 1894); Bashkirtseff, Marie, 'Further Memoirs' (London 1901); Symons, Arthur, 'Studies in Prose and Verse' (New York 1904); Mahn, P., 'Guy de Maupassant, sein Leben und seine Werke' (Berlin 1908); Matthews, Brander, 'Inquiries and Opinions' (New York 1907).

MAUPERTUIS, Pierre Louis Moreau de, pē-ār loo-ē mō-rō dė mō-pĕr-tü-ē, French mathematician and philosopher: b. Saint Malo, France, 28 Sept. 1698; d. Basel, Switzerland, 27 July 1759. He was educated at the College of La Marche, Paris; entered the army in 1718 and after five years' service resigned in order to become instructor in mathematics in the Academy of Sciences. He went to England in 1728, where he was made a member of the Royal Society and became a pupil of Newton. In 1736 he conducted a scientific expedition to Lapland for the purpose of measuring an arc of the meridian, the result of which was confirmation of Newton's theory of the flattening of the globe at the poles. In 1743 he was elected to the French Academy, in 1744 was summoned to Prussia by Frederick the Great and in 1746 was declared president of the Academy of Sciences at Berlin. A dispute with the philosopher, Kŏnig, regarding the discovery of the infinitesimal calculus shortened his days. Among his works are 'Sur la figure de la terre' (1738); 'Discours sur la figure des astres' (1742); 'Lettre sur la comète de 1742' (1742); 'Astronomie nautique' (1745; 1756); 'Essai de cosmologie' (1750); Maupertiana ou divers ecrits' (1753). Consult De la Baumelle, 'Vie de Maupertuis' (Paris 1856); Damiron, J. P., 'Memoires sur Maupertius' (ib. 1858); id., 'Mémoires pour servir à l'histoire de la philosophie du XVIIIe siècle' (Vol. III, ib. 1864).

MAUREL, mō-rĕl, Victor, French singer: b. Marseilles, 1848. He was educated at the Paris Conservatoire and made his début in Paris in 1869. His first appearance in Royal Italian Grand Opera was in 1873 and he achieved a signal success. He created Iago in Verdi's 'Otello,' Falstaff in the opera of that name, and has appeared in many operatic rôles in Europe and United States, being generally recognized as the leading acting baritone actor on the Italian stage. He has published 'L'Art du chant'; 'Le chant renové par la science'; 'Dix ans de carrière,' etc.

MAUREPAS, Jean Frédéric, zhŏñ frā-dā-rēk mō-rė-pā, **Phélypeaux,** COMTE DE, French statesman: b. Versailles, 9 July 1701; d. there, 21 Nov. 1781. At 14 he succeeded to the office of Minister of State held by his father. In 1725 he became administrator of the navy, in which post he used the best knowledge then available to bring the navy to a high standard of perfection. He became Minister of State under Louis XV in 1738, but in 1749 was banished the court for an attack on Mme. Pompadour. In 1774 he was made Prime Minister by Louis XVI and became his principal adviser. The chief events of his administration were the restoration of the Parliament of Paris (12 Nov. 1774), and the alliance with and assistance of the American colonies in their struggle against Great Britain. He gathered

to the service of the state such men as Lamoignon-Malesherbes, Vergennes and Turgot. He intrigued against the latter and replaced him as Minister of Finance by Necker in 1776. Five years later Necker experienced the same fate. Consult Guyot, 'Eloge historique de M. de Maurepas' (1782); the apocryphal 'Mémoirs' edited by J. L. C. Soulavie (4 vols., Paris 1792) and 'Lettres de M. de Maurepas' (Paris 1896).

MAURICE, mâ'ris **(John), Frederic Denison**, English Anglican theologian and author, one of the leaders of the Broad Church movement: b. Normanston, Suffolk, 29 Aug. 1805; d. Cambridge, 1 April 1872. He was son of a Unitarian clergyman; was educated at Trinity Hall, Cambridge; settled in London, where he was editor of the *Athenæum* for several years; and having decided to take holy orders entered Exeter College, Oxford. In 1834 he became curate of Bubbenhall, and two years later chaplain to Guy's Hospital. He became professor of history in King's College, London, in 1840, and of divinity as well in 1846, but was deprived of both chairs in 1853 because of the liberal tenor of his 'Theological Essays.' Up to 1860 he was chaplain of Lincoln's Inn, and from 1860 to 1869 incumbent of Saint Peter's, Vere street, London. In 1866 he was elected professor of moral philosophy at Cambridge. During his life in London Maurice founded the Working Men's College and Queen's College (for women), took a prominent part in various practical philanthropies and was a leader of the Christian Socialists. He was a man of wonderfully sweet and beautiful character; a fervent preacher, who made much of the fatherhood of God; and a social reformer, whose lack of success was due to the fact that he was before his time. Among Maurice's works are 'Eustace Conway,' a novel (1834); 'The Epistle to the Hebrews'; 'Warburtonian Lectures' (1846); 'The Religions of the World'; 'Boyle Lectures' (1847); 'The Lord's Prayer,' sermons (1848); 'History of Moral and Metaphysical Philosophy' (1850–60); 'Ecclesiastical History of the First and Second Centuries' (1854); 'The World "Eternal,"' urging that "eternal punishment" is not "everlasting punishment" (1863); 'Casuistry, Moral Philosophy, and Moral Theology' (1866); 'The Conscience' (1868); 'The Lord's Prayer, A Manual' (1870). Consult the 'Life, chiefly told in his own Letters,' by his son (2 vols., London 1884); Collins, W. E., 'Typical English Churchmen' (London 1902); Hughes, T., 'The Friendship of Books' (ib. 1873); Rogers, 'Men and Movements in the English Church' (ib. 1898).

MAURICE, Sir **Frederick Barton**, Major-General, English soldier: b. 19 Jan. 1871. He entered the army in 1892, rose to captain in 1899 and brevet-major in 1900. He served in the Tirah campaign 1897–98 and in the South African War, 1899–1900. He accompanied the first British Expeditionary Force in the European War, landing in France on 11 Aug. 1914, was "mentioned in despatches" and created K. C. M. A. During 1915–16 he served as Director of Military Operations on the Imperial General Staff, was awarded the French Croix de Guerre and made a commander of the Legion of Honor. On 7 May 1918 he published a letter in *The Times* contradicting certain statements made in Parliament by the Premier (Mr. Asquith) and other ministers with regard to what had passed at the Allied War Council at Versailles. The matter concerned the disposition of British troops and the strength of the army. The letter caused a great sensation and led to a "censure debate" in the House of Commons on 9 May 1914, in which the House rejected the Premier's motion for the appointment of a select committee to investigate the matter. On 14 May the Army Council placed Major-General Maurice on "retired pay." Though the letter had not been submitted to the Press Bureau before publication, in accordance with war-time regulations, no further steps were taken by the government. On his retirement General Maurice became military correspondent for the *Daily Chronicle*. His writings are marked by lucidity and keen penetration. In a remarkable book, 'Forty Days in 1914' (London and New York 1919), he traces the complicated and momentous campaign to the end of the battle of the Marne. His other publications include 'The Russo-Turkish War 1877–78,' a biography of his father, 'Sir Frederick Maurice: A Record,' and contributions to the 'Cambridge Modern History.'

MAURICE OF NASSAU, Prince of Orange and Count of Nassau: b. Dillenburg, Nassau, 13 Nov. 1567; d. The Hague, 23 April 1625. His father, William the Silent, was assassinated in 1584, and the 18-year-old boy was chosen stadtholder by the provinces of Holland and Zealand, and later by the other provinces, the command of the army being entrusted to him in 1587 by the States-General. He captured Breda, Zutphen and Nimeguen in 1590–91, and by 1597 had wrested the principal towns of the Netherlands from the Spanish. But Ostend was lost in 1604 and in 1609 a truce was made with Spain for 12 years. In 1618 he became Prince of Orange on the death of his brother Philip William. Internal dissensions followed and Olden Barneveldt, leader of the aristocratic republicans and of the party of religious tolerance, was condemned to death (1619) on the charge of high treason, but actually because of his opposition to Maurice. The stadtholder renewed the war with Spain in 1621, immediately upon the expiration of the truce, and died at the very time he was negotiating an alliance with France and with England. The greatest general of his day he was personally cold and unscrupulous. See Holland and consult Kemp, C. M., 'Maurits v. Nassau, prins v. Orange in zijn leven en verdiensten' (4 vols., Rotterdam 1843); Nutting, M. O., 'The Days of Prince Maurice' (Boston 1894); van Prinsterer, G. Groen, 'Archives ou correspondence de la maison d'Orange-Nassau' (1 series, 9 vols., Leiden 1841–61).

MAURICE OF SAXONY, Duke and Elector of Saxony, German soldier: b. Freiberg, 21 March 1521; d. near Sievershausen, 11 July 1553. He succeeded his father, Henry the Pious, as Duke of Saxony, in 1541; and although a Protestant refused to join the Schmalkald League. In 1548, two years after a secret treaty with the Emperor Charles, Maurice was made Elector of Saxony. But he soon broke with the emperor, fathoming his purpose of crushing the German princes, and by a sudden show of force made Charles sign the Treaty of Passau, 31 July 1552. On the 9th of

July in the following year he defeated Albert of Brandenburg-Kulmbach, who had refused to accede to the Treaty of Passau, in the battle of Sievershausen, but died two days later of his wounds. Maurice was the foremost general and diplomat of his day in Germany, but he was entirely without scruple or principle, and played off one party against another until he was little trusted by either. Consult Brandenburg, E. (ed.), 'Politische Korrespondenz' of the Elector Maurice (Leipzig 1904); id., 'Moritz von Sachsen' (Leipzig 1898); von Ranke, L., 'Deutsche Geschichte im Zeitalter der Reformation' (ib. 1882); 'The Cambridge Modern History' (Vol. II, Cambridge 1903).

MAURICIUS, mâ-rish'ĭ-ŭs, **Flavius Tiberius,** emperor of the East, 582–602 A.D.: b. Arabissus, Cappadocia, about 539 A.D.; d. Chalcedon, 27 Nov. 602 A.D. He served with distinction against the Persians, and for his abilities and character was made successor to Tiberius II by that emperor, whose daughter, Constantina, he had married. His reign was filled with wars. In 591 he restored Chosroes II to the throne of Persia, thus bringing to a close the long campaign against that country. He was, however, one of the greatest and best of the Eastern emperors, a patron of the arts and sciences, and himself considerably learned. Phocas, one of his generals, commanding the army operating against the Avars, led a revolt against him, and he fled to Chalcedon, where he was murdered by Phocas' order. The *Στρατηγικά*, a work on military affairs, published in a Latin version by Scheffer at Upsala in 1664 was long attributed to him, but is really by some unknown contemporary. Consult Bury, J. B., 'The Later Roman Empire' (London 1889); Finlay, G., 'History of Greece' (Oxford 1877); Gibbon, E., 'Decline and Fall of the Roman Empire' (London 1896).

MAURISTS, mâ'rists, the members of the Congregation of Saint Maur, to whom literature owes the stately tomes known as "Benedictine Editions." The Congregation had its origin in a reform of the Benedictines in the early part of the 17th century; it was supported by De Retz and afterward by Richelieu, and in 1720 possessed in France six provinces, containing 180 abbeys and priories, of which the principal was that of Saint-Germain-des-Prés, Paris. Among the most celebrated of the Maurists are Mabillon, Martene, Montfaucon, the founder of the science of archæology, Ruinart, Lami, Le Nourri and Martianay. Jansenism seems to have affected some of the convents, and, according to Badiche, a Masonic lodge was established at Glanfeuil in 1755, over which the prior of the monastery in that place presided. The Congregation was suppressed in 1792. The last superior-general with 40 members of his order perished by the guillotine. In their literary work they produced a great number of works of permanent value. Their complete bibliography comprises over 700 works by 220 authors. The Revolution put an end to the work, for which hundreds of volumes and literary documents had been collected. The Bibliothèque Nationale de Paris contains most of this material. Consult Helyot, 'Histoire des ordres religieux' (1718); McCarthy, 'Principal Writers of the Congregation of Saint Maur' (1868); Tassin, 'Histoire littéraire de la congregation de Saint-Maur' (Paris 1770); de Lama, 'Bibliothèque des écrivains de la congregation de Saint-Maur' (ib. 1882).

MAURITANIA, mâ-rĭ-tā'nĭ-ą, West Africa, colony in the government-general of French West Africa. It consists of the districts of Trarza, Brakna, Gorgol, Guidimaka, Levrier Bay and Tagant. The total area is 344,967 square miles. The population in 1912 was about 222,051, of whom 221,897 were nomad Moors. In 1909 the French protectorate was extended over these districts; a provisional government with civil and military functionaries was formed under the name of Mauritania. Early in 1916 the region of Tibesti, recently occupied by the French, was attached administratively to French West Africa. The budget of Mauritania for 1916 was $334,000.

MAURITIUS, mâ-rish'ĭ-ŭs, or **ISLE OF FRANCE,** an island colony of Great Britain, in the Indian Ocean, 500 miles east of Madagascar and 9,500 miles from England. It is of an oval form, about 40 miles in length from northeast to southwest, and 25 miles in breadth; area, 720 square miles. There are numerous capes and bays along the shore and the island is surrounded by coral reefs. It is composed chiefly of rugged and irregular mountains, rising into points of considerable height; the highest are the Montagne de la Rivière Noire, 2,730 feet, and the singular isolated rock Peter Botte, 2,700 feet. Between the mountains, and along the coast, there are large and fertile plains and valleys, having a rich soil of black vegetable mold or stiff clay, watered by numerous streamlets, many of which become periodically dry. The climate is pleasant during the cool season, but oppressively hot in summer, and the island is occasionally visited by severe epidemics of fever. The rainy season is from January to April; between December and March the island is subject to hurricanes, occasionally of extraordinary violence. When discovered in 1505 the island was almost entirely covered with wood, the greater part of which has now been cut down, although some extensive forests still remain. The fauna then included the dodo, but otherwise was in no way remarkable. Some of the trees are valuable, particularly the black ebony. The indigenous vegetation includes orchids, screw-pines, the traveler's-tree, bamboo, etc. Many plants introduced from Europe, Africa, Madagascar and India thrive well, and nearly every beautiful tropical tree or delicious fruit is met with. The principal item of cultivation is sugar-cane, and to a limited extent rice, maize, manioc, vanilla, coffee, spices, fruits and tea, the last introduced recently. The value of the exports of unrefined sugar, which is the staple, amounted in 1916 to $23,103,320. Other exports are rum, vanilla, cocoanut oil, aloe-fibre, spice. The total value of exports in 1916 was $24,770,-015; of imports, $17,988,970. The imports consist of rice, wheat, cottons, haberdashery, machinery, manures, carriages and parts, coal, iron and steel, etc. Letters patent of 1885, 1901, 1904 and 1912 have established a partially representative form of government. The government of the island, with its dependencies, Diego Garcia, Rodrigues, etc., is vested in a governor, an executive council, comprising the commander of the forces, the colonial secretary, procurator-

general, receiver-general and other persons in the public service, whom the governor may designate as members of the council. The council of government consists of the governor and 27 members, nine of whom are named by the governor, eight are ex officio members and 10 are elected under a restricted franchise. The Indians are nearly all Hindus. The churches receive government aid—$50,880 in 1915–16.

The shipping on 1 Jan. 1916 comprised three steamers aggregating 1,080 tons and 28 sailing vessels aggregating 4,440 tons. In 1916 199 vessels of 438,960 tons entered and 197 vessels of 418,898 tons cleared the harbors of Mauritius. About 76 per cent of this tonnage was of British register. There are 621 miles of telegraph and 140 miles of telephone wires installed. Mauritius has cable connection with Australia, Madagascar, Reunion and Zanzibar. Consult the 'Mauritius Blue Book' (annual); Anderson, J. F., 'The Sugar Industry of Mauritius' (London 1899); Decotter, N., 'Géographie de Maurice et de ses Dépendances' (Mauritius 1891); Keller, C., 'Madagascar, Mauritius and other East African Islands' (London 1900); 'Oxford Survey of the British Empire' (Vol. III, London 1914); Rae, W. C., 'Handbook on the Constitution, Practice and Proceedings of the Council of Government' (Mauritius 1901); Walter, A., 'The Sugar Industry of Mauritius' (London 1909). The revenue for 1915–16 was $4,325,015, and the expenditure $3,830,315. The chief sources of revenue are the customs, licenses and permits, and the railways; the expenditure is chiefly on the civil service and on the railways, which have a total length of 120 miles. The currency is in rupees and cents. Schools are kept up partly by government, partly by private agencies. In 1917 there were 49 government and 91 aided schools. The average attendance at government schools was 6,670 and 8,991 in aided schools. The highest institution is the Royal College, a school affiliated to London University. In 1915–16 the government expended $209,765 on education. The French language and French law prevail in the colony, and the majority of the white inhabitants are of French origin. Mauritius was discovered in 1505 by the Portuguese. The Dutch took possession of it in 1598, and named it Mauritius in honor of Prince Maurice. It eventually fell into the hands of the French, from whom it was captured by the British in 1810, and it was definitely ceded to them in 1815. Principal towns, Port Louis, the capital, Curepipe and Mahébourg. Rodrigues, Diego Garcia, the Seychelles and some other islands of the Indian Ocean are dependencies of Mauritius. The scene of Bernardin de Saint Pierre's celebrated 'Paul et Virginie' is laid in this island. In 1911 the population of the island, including dependencies (6,690) and military (1,602), was 377,083, consisting of the general population of 115,146, the Indian population of 258,251, and 3,686 Chinese. There were in the same year 122,424 Roman Catholics and 6,946 Protestants.

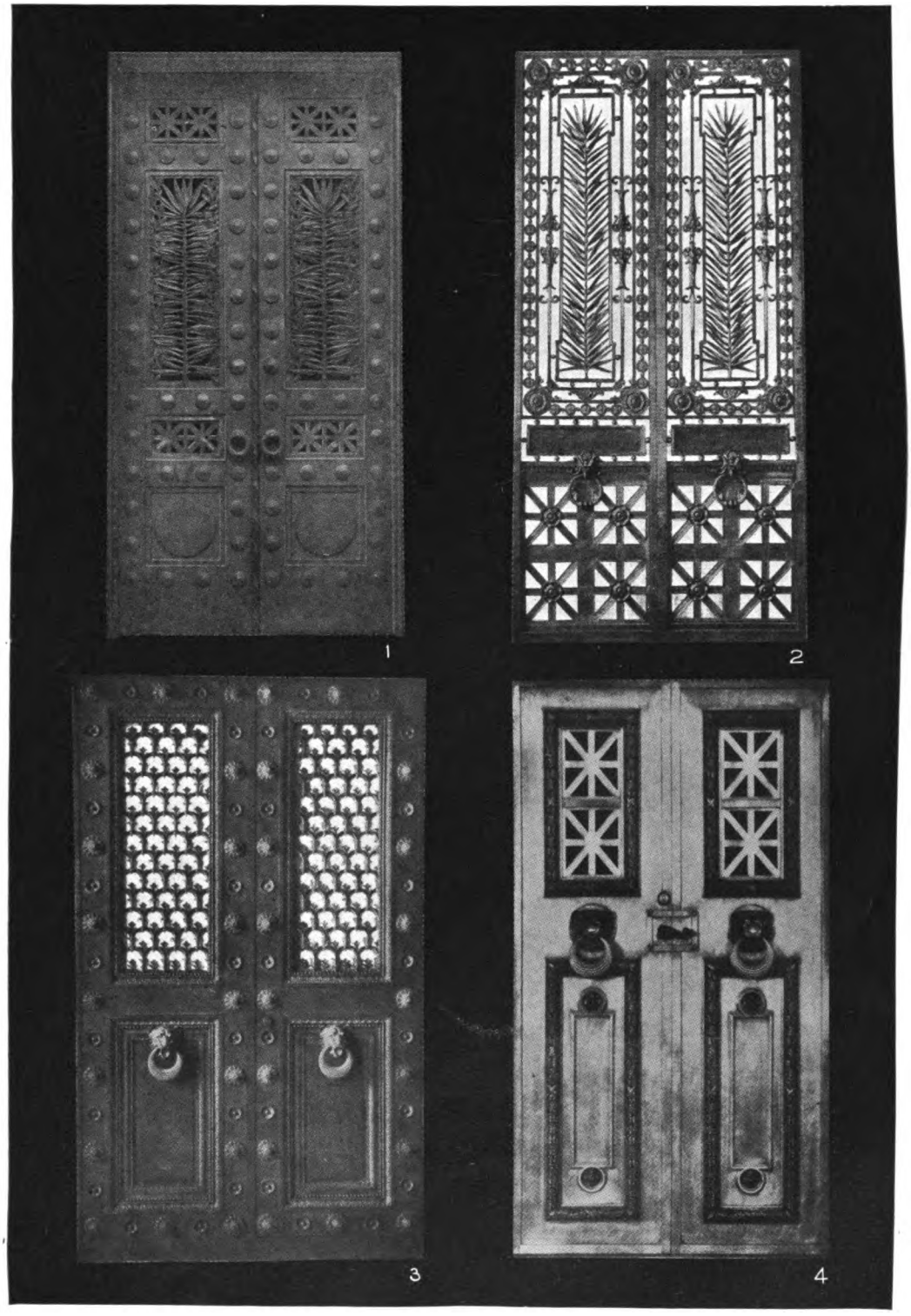
MAURITIUS HEMP. See FIBRE.

MAUROCORDATOS. See MAVROCORDATOS.

MAURY, mâ'ri, **Dabney Herndon,** American military officer and engineer: b. Fredericksburg, Va., 21 May 1822; d. Peoria, Ill., 11 Jan. 1900. He was graduated from West Point in 1846 and served in the Mexican War. He was brevetted 1st lieutenant in 1847 for "gallant and meritorious conduct" at Cerro Gordo, and served in the United States Military Academy as instructor, 1847–52. In 1858 he was engaged as superintendent of cavalry instruction at Carlisle Barracks. At the beginning of the Civil War he was brevet-captain, but resigned to enter the Confederate army, where he attained the rank of department commander of the Army of the Gulf. At Vicksburg in 1862 he was Sherman's opponent and subsequently had charge of the Department of Tennessee with the rank of major-general. He again served the United States government when under President Cleveland's first administration he was Minister to Colombia. He published 'Skirmish Drill for Mounted Troops' (1859); 'Recollections of a Virginian in the Mexican, Indian and Civil Wars' (1894); 'Young People's History of Virginia and Virginians' (1904).

MAURY, Matthew Fontaine, American naval officer and hydrographer: b. in Spottsylvania County, Va., 14 Jan. 1806; d. Lexington, Va., 1 Feb. 1873. He studied at the Harpeth Academy in Tennessee, and entered the United States navy in 1825. During a voyage around the world in the *Vincennes* he began a treatise on navigation, long used as a textbook in the navy. He was made lieutenant in 1836. In 1839, when he was lamed by an accident, he quitted active sea-service for scientific work at the Naval Observatory. His powers of application were combined with rare gifts of imagination, and an elevated style. His 'Physical Geography of the Sea and Its Meteorology' (1855) has been considered a book of fascinating interest. In 1844 he published his views on the Gulf Stream, ocean currents and great-circle sailing. His 'Wind and Current Charts' have been of immense benefit to navigation. In 1853 he reached the rank of commander, and in that year projected the maritime conference at Brussels, and also published 'Letters on the Amazon and the Atlantic Slopes of South America.' In 1861, when the Southern States seceded, he gave his services to the Confederate cause. For some time he attached himself to the fortunes of the Emperor Maximilian in Mexico; but for the last few years of his life was professor of physics at the Virginia Military Institute. He was among the first to turn fresh attention to a branch of scientific inquiry which had been previously much neglected, the investigation of the depths of the sea, its currents, temperature, etc. He also published 'Lanes for Steamers Crossing the Atlantic' (1854). Consult Corbin, 'Life of Matthew Fontaine Maury' (London 1888).

MAUSER, Paul von, powl mow'zĕr, German inventor and gun-maker: b. 1838; d. 29 May 1914. He worked as a boy in the royal armory at Oberndorf, and there with his brother Wilhelm (d. 13 Jan. 1882) patented several improvements on the small arms then in use, both new needle-guns and a model replacing the "needle" powerful percussion-pin. The introduction of the Prussian needle-gun into Würtemberg after the Austro-Prussian War deprived the brothers of the patronage of the



Courtesy, The Gorham Company

MAUSOLEUM DOORS

1 By Cass Gilbert, architect
2 By Carrere & Hastings, architects
3 By Dehli & Howard, architects
4 By Shiekel & Ditmars, architects

government, and in 1867 he settled in Liége, where he was financed by an American capitalist. Paul invented the Mauser revolver in 1879 and the "Mauser" in 1882. He made the Turkish model in 1887, the Belgian repeating rifle in 1889, the Argentine model in 1891, the Spanish model in 1893 (adopted with slight change throughout South and Central America), and in 1896 a rifle for the Swedish army. Typical of his rifles are the Belgian model of 1889 and the Argentine of 1891, both magazine rifles with no cut-off, but capable of single fire by replacing the top cartridge in the magazine after each discharge. The magazine holds five cartridges, lies in front of the trigger guard and under the receiver, is fixed in type but easily cleaned. See SMALL ARMS.

MAUSOLEUM (Greek, *mausoleion*), a tomb or burial place, the name of which is derived from Mausolus, a king of Caria, to whom a sumptuous sepulchre was raised by his wife, Artemisia, at Halicarnassus. King Mausolus died 353 B.C.; and his wife was so disconsolate that she perpetuated his memory by the erection of this magnificent monument which became so famous as to be esteemed the seventh wonder of the world, and to give a generic name to all superb sepulchres. Its entire height was 140 feet, and the entire circuit 411 feet. It was overthrown, probably by an earthquake, between the 12th and 15th centuries; and when the Knights of Rhodes took possession of Halicarnassus in 1404 they availed themselves of the materials of the mausoleum to erect the fortress of San Pietro. Parts of the frieze were transported to the British Museum in 1846. Other famous mausoleums are that erected at Babylon by Alexander the Great in honor of Hephæstion, equally magnificent with that of Mausolus, though less refined; and the mausoleum of Augustus, built by him in the sixth consulate on the Campus Martius, between the Via Flaminia and the Tiber, the ruins of which are still seen near the church of Saint Roque. One of the obelisks which stood before this superb building was found in the reign of Pope Sixtus V. This mausoleum contained the ashes of Augustus, Marcellus, Agrippa, Germanicus and of some later emperors. The mausoleum of Hadrian at Rome is now the Castle of San Angelo. Consult Adler, 'Das Mausoleum zu Halikarnas' (Berlin 1900); Newton, 'History of Discoveries at Halicarnassus, Cnidus and Branchidæ' (London 1863); id., 'Travels and Discoveries in the Levant' (ib. 1865); Smith, A. H., 'Catalogue of Sculptures in the British Museum' (Vol. II, ib. 1900).

MAUSTON, mâs'tŏn, Wis., city, county-seat of Juneau County, on the Lemonweir River, and on the Chicago, Milwaukee and Saint Paul Railroad, about 130 miles northwest of Milwaukee. The chief manufacturing establishments are lumber mills, machine shops and flour mills. Pop. 1,701.

MAUTHNER, mout'nĕr, **Fritz**, German novelist and philologist: b. Horzitz, Bohemia, 29 Nov. 1849 of well-to-do Jewish family; went to Prague at an early age, studied law there and became a contributor (1876) of the *Berliner Tageblatt* for which he continued writing in various departments (particularly dramatic criticism) until 1905, when he retired from newspaper work and moved from Berlin (where most of his active life was spent) to Freiburg im Breisgau; he lived at Meersburg on Lake Constance from 1909. While he has written novels and satiric romances, his greatest work is in the field of philosophical criticism of language as a means of expression; his position on this matter is best expressed in a large book: 'Beiträge zu einer Kritik der Sprache' (Vol. I, 'Sprache und Psychologie,' 1901; Vol. II, 'Zur Sprachwissenschaft,' 1901; Vol. III, 'Zur Grammatik und Logik,' 1902); and in an alphabetically arranged summary of the contents of this work, in dictionary form: 'Wörterbuch der Philosophie' (Munich and Leipzig 1910). His criticism is poetic and destructive rather than social in its import; his style smooth and brilliant. His most famous work before he undertook scholarly production was 'Nach verühmten Mustern' (Stuttgart 1878; 30th ed., 1902), a set of parodies of well-known German and foreign writers, in the manner of Bret Harte. In 1914 he published a collection of newspaper articles that had appeared in previous years, under the title, 'Gespräche im Himmel,' and in 1918 began the publication of an autobiographical work, the first volume of which deals with his school-days in Bohemia and is a rather bitter attack upon the educational system of the time. Among other works are 'Vom armen Franischko' (Dresden 1879); 'Die Sonntage der Baronin' (Dresden 1881); 'Der neue Ahasver' (Dresden 1881); 'Xanthippe' (Dresden 1884); 'Aturenbriefe' (Dresden 1885); 'Berlin W.' (a cycle of three novels, Dresden 1886–90); 'Die bunte Reihe' (Munich 1896). There may be had, in English translation, 'Aristotle, an Unhistorical Essay' (New York 1906). On Mauthner's philosophical doctrine, consult Wells, H. G., 'A Criticism of the Instrument' (appendix to 'A Modern Utopia' 1905).

MAUVAISES TERRES, mō-vāz tĕr. See BAD LANDS.

MAUVE, mōv, an aniline purple coloring matter. See DYES.

MAVERICK, Peter, American engraver: b. New York, 22 Oct. 1780; d. there, 7 June 1831. He studied engraving under his father, worked especially on bank-note designs and made famous engravings of Charles King's portrait of Henry Clay, of Waldo's portrait of Andrew Jackson and of Dunlap's portrait of Benjamin Moore. Maverick was one of the founders of the National Academy of Design in 1826. His most celebrated pupil was Asher B. Durand.

MAVERICK, an unbranded steer, especially one appropriated by a chance finder. This term, in common use in the cattle country of the United States, is said to be derived from the name of Samuel Maverick, a Texas lawyer and politician, who, having accepted a herd of 400 head of cattle in payment of a debt, left them in charge of one of his men. They were neglected and allowed to run wild and when the calves were born they were of course appropriated by other ranchers and branded with their marks, and so passed to their undisputable ownership. As the ownership of the cattle was determined by the brand, it may easily be seen why the name "Maverick's" was given to all calves caught straying from the herd. From

this use of the word grew a wider application to anything dishonestly come by.

MAVIS, the Scottish name for the British songthrush or throstle (q.v.), one of the favorite song-birds of western Europe.

MAVOR, James, English political economist: b. Stranraer, Scotland, 8 Dec. 1854. He was graduated from the University of Glasgow. He was for a time editor of the *Scottish Art Review;* in 1888 became professor of political economy at Saint Mungo's College, Glasgow, and in 1892 professor of political economy at the University of Toronto, Canada. He has written 'Wages Theories and Statistics' (1888); 'Economic Theory and History Tables and Diagrams' (1890); 'Currency Reform' (1891); 'Economic Study and Public and Private Charity' (1892); 'English Railway Rate Question' (1894); 'Railway Transportation in America' (1909); 'Economic Survey of Canada' (1914); 'Applied Economics' (1914); 'A Short Economic History of Canada' (1915).

MAVROCORDATOS, mäv''-rō-kŏr-dä'-tŏs, or **MAUROCORDATOS, Alexander,** modern Greek soldier and statesman: b. Constantinople, Turkey, 15 Feb. 1791; d. Ægina, 18 Aug. 1865. He was a skilful linguist and early schooled in diplomacy. On the outbreak of the Greek war for independence (1821), he devoted his entire fortune to the equipment of a ship and the arming of volunteers. He organized the insurrection in Ætolia and Acarnania, was made president of the National Assembly at Epidaurus, drew up the provisional constitution and signed the proclamation of independence (January 1822). He also became president of the executive council, but resigned in what he believed to be the interests of harmony. In 1833–34, 1841–43, 1844 and 1854–56, he was at the head of the Cabinet and in 1850–54 was Ambassador at Paris. He promoted public education and was a Liberal in politics, being of the British party and opposed to the Russian policy of Giovanni and Augustin Capo d'Istria. He is generally considered the most important leader in the Greek Revolution. Consult Browning, Oscar, 'History of the Modern World' (Vol. I, New York 1912).

MAWSON, Sir Douglas, Australian geographer: b. Bradford, Yorkshire, 1882. He was educated at Sydney University, where he was graduated bachelor of mining engineer in 1901. In the following year he was demonstrator in chemistry there. In 1903 he made a geological exploration of the New Hebrides and lectured at Adelaide University in 1905. In 1908 he became a member of the scientific staff of Sir Ernest Shackleton's Antarctic Expedition and determined the position of the south magnetic pole on Victoria Land. In 1911–14 he was leader of the Australasian Antarctic Expedition to explore Antarctic lands and establish stations for scientific purposes. His discoveries were among the most important made so far in the 20th century. In 1915 he was awarded the founder's medal of the Royal Geographical Society and was knighted in 1914. He has published 'The Home of the Blizzard' (2 vols., Philadelphia 1915) and scientific papers in the transactions of learned societies. For a detailed account of the explorations directed by Mawson see Antarctic Regions.

MAX, mäks, **Gabriel von,** German painter: b. Prague, 23 Aug. 1840. The son of a sculptor, with whom he studied for a time, he soon devoted himself to painting, then went to the Prague Academy under Engerth's teaching, and, after several years at Vienna, became a pupil of Piloty in Munich, where he was professor in the Academy from 1879 to 1883. His work is largely fantastic; he aims to interpret music, especially that of Beethoven, Mendelssohn and Liszt; and is fond of psychic themes, although occasionally, as in his famous pictures of monkeys, going to an extreme of realism, explained by his earnest belief in Darwin and Haeckel. But he is best known for his historical and figure paintings, which usually show a female figure of some beauty and ethereal charm, with dreamy, longing, sentimental eyes. In such pictures as these the flesh tones are particularly remarkable, being sometimes styled marble-like and due to his early training as a sculptor and again described as a twilight of sentiment, typifying the spiritual. To this class belong 'Spirit Greetings' (1879); 'The Last Token,' now in the Metropolitan Museum, New York (1874); 'Nydia' (1874); 'Veil of Saint Veronica' (1874); 'The Lion's Bride,' in the Museum of Manchester (1875), and many book illustrations, notably those for Schiller's and for Lenau's poems, for Goethe's 'Faust' (the 'Marguerite before the Mater Dolorosa' being especially well known), for Wieland's 'Oberon' and for Uhland's works. Max was ennobled in 1900. Consult Klemt, 'Gabriel Max und seine Werke' (Vienna 1887); Mann, N., 'Gabriel Max, Kunst und seine Werke' (Leipzig 1888); and Meissner (in 'Die Kunst unserer Zeit,' Munich 1899).

MAXENTIUS, mak-sen'shi-us, **Marcus Aurelius Valerius,** Roman emperor: d. 27 Oct. 312. He was the son of Maximianus, and in 306 A.D. was proclaimed Augustus by the prætorians and acknowledged by the people and Senate of Rome, to whom Galerius had become hateful. Severus, sent by Galerius against him and his father, was compelled by Maximianus to retreat to Ravenna and was put to death in 307. Galerius was likewise compelled to retreat and Maxentius, availing himself of an insurrection of the Africans under a certain Alexander, in 311 declared war against Constantine the Great. While Constantine pressed forward into Italy, Maxentius himself remained inactive at Rome and did not go out to meet Constantine till he had passed unopposed across the Apennines. At the great battle fought shortly after, at Saxa Rubra near Rome, Maxentius was defeated and perished in the Tiber as he tried to escape over the Mulvian Bridge. See Constantine; Rome — *History.*

MAXEY, Samuel Bell, American soldier: b. Tompkinsville, Ky., 30 March 1825; d. Texas, 16 Aug. 1895. When Maxey was a child his parents removed to Paris, Tex., where the son was educated until prepared to enter West Point, from which he was graduated in 1846, assigned to the infantry and at once sent to Mexico. He took part in the campaign from Vera Cruz to the City of Mexico and was brevetted for bravery at Contreras. As soon as the war was ended Maxey resigned to begin the practice of law. For 12 years he practised

in Kentucky and Texas. He entered the Confederate service as colonel of the 9th Texas Infantry and was engaged in the campaigns east of the Mississippi River under A. S. Johnston, Bragg and Joseph E. Johnston. In 1862 he was made brigadier-general. In 1863 he was sent to command the Indian Territory. He raised and equipped numbers of troops, kept the Indians friendly to the Confederacy and in 1864 he drove back the Federal general, Steele, who was endeavoring to effect a junction with Banks in the Red River Valley. For this he was made major-general. After the war he was offered a Supreme Court judgeship in Texas but declined. From 1875 to 1887 he was in the United States Senate. Maxey was an able senator, a member of the prominent committees and an efficient advocate of Western interests.

MAXIM, Sir **Hiram Stevens,** Anglo-American inventor: b. Sangerville, Me., 5 Feb. 1840; d. London, England, 24 Nov. 1916. As a boy he received his early education in the country schools of Maine. What little spare time he had after attending to his work on the farm and in his father's workshop was spent in the pursuit of scientific knowledge. When he was 14 years old he was sent as an apprentice to a carriage builder at East Corinth, Me. Later, while employed in a laboratory in Boston, he perfected his first invention, a method of carbureting air and gas for lighting purposes. His invention was used in many New York hotels. Others of his inventions included electrical devices, improvements on incandescent lamps, self-registering current machines and other similar contrivances. When he was 28 years old he was employed as a draughtsman in a shipbuilding firm in New York City. While there he invented a locomotive headlight, which was used generally. In 1884 Maxim perfected the automatic rifle, or machine gun, in which the recoil due to the explosion of one cartridge was utilized to eject the empty shell and at the same time reload the weapon. The inventor was then in England. The government, interested at once in the possibilities presented by the rifle, adopted it. It was the Maxim gun that was an important factor in winning the Egyptian campaign for the English. It is now used by the armies throughout the world. Closely following came the "disappearing gun," cordite and other smokeless powders, a gun for hurling aerial torpedoes and the "delayed action" fuse. For many years Sir Hiram experimented with aeronautics. In 1894 he succeeded in building a heavier-than-air machine. At that time when aeroplanes were only thought possible, Sir Hiram Maxim criticised the British nation for lack of interest in aeronautics and predicted that a bombardment of the island from airships was possible. Sir Hiram held membership in the American Society of Civil Engineers, the Royal Society of Arts, the British Association for the Advancement of Science and many other bodies. He became a naturalized citizen of Great Britain because of alleged unfair treatment of his inventions by the American government. Sir Hiram Stevens Maxim will be remembered as one of the foremost inventors of his day. In 1881 President Grevy of France made him a Chevalier of the Legion of Honor. This decoration was followed in 1901 by recognition by the British government, Queen Victoria elevating him to the knighthood.

MAXIM, Hudson, American inventor and engineer: b. Orneville, Me., 3 Feb. 1853. He received an academic education with especial reference to the natural sciences and engineering, then took up the study of medicine; entered the printing and subscription book publishing business at Pittsfield, Mass., in 1883, but gave up the publishing business in 1888 to take up business of ordnance and explosives. He was the first to make smokeless gunpowder in the United States and was the first to submit samples to the government for trial. In 1890 he built a dynamite factory and smokeless powder mill at Maxim, N. J., named for him. It was there that the multi-perforated smokeless powder was developed and perfected under his inventions and patents, which was adopted by the United States government. These patents were purchased by the E. I. du Pont de Nemours Powder Company, of Wilmington, Del., in 1897. He invented the process of making calcium carbide by incandescence of molten carbide conductor, now in general use. In 1901 he sold United States government the secret of the high explosive Maximite invented by him (see Explosives); invented United States service detonating fuse for high explosive projectiles. He invented the system of driving torpedoes by steam and products of combustion of a self-combustive compound called motorite, the steam being generated by the motorite. This system was purchased by the United States navy. Since 1898 he has been consulting engineer for E. I. du Pont de Nemours Powder Company. He invented stabillite (q.v.), a smokeless powder made without volatile solvent, which consequently requires no drying. He received the degree of D.Sc. from Heidelberg University, Ohio, in 1913. He is member of consulting board of United States navy; of Albany Burgesses Corps (rank, captain); of Military Service Institution; of Society of Chemical Industry; of Chemists Club; of Aeronautical Society; Fellow A. A. A. S., of Society of Applied Psychology. He is author of 'The Science of Poetry and the Philosophy of Language' (1910); 'Defenseless America' (1915).

MAXIMA AND MINIMA. The maxima and minima of a function $f(x)$ are the points of the curve $y=f(x)$ where y is larger or smaller, respectively, than for any value of x differing from the value at that point by less than some finite number. According to this definition, a curve may have several maxima or minima, and a maximum or minimum need not be a point where y assumes the greatest or least value, respectively, throughout the entire curve. It is easy to see that a maximum is a point where the curve ceases to go up and begins to go down. At such a point, the slope of the curve, or the differential coefficient $\frac{dy}{dx}$, changes sign. If $\frac{dy}{dx}$ is continuous at a maximum, it can only be 0, and at any rate, on an algebraic curve, it can only be 0 or ∞. Thus the maxima — likewise the minima — are all to be found among the points where $\frac{dy}{dx}=0$ or ∞.

If $\frac{d^2y}{dx^2} > 0$, we have a minimum, of $\frac{d^2y}{dx^2} < 0$, a maximum. However $\frac{dy}{dx}$ may be 0 or ∞ without their being a maximum or minimum at the point. In this case $\frac{d^2y}{dx^2}$ will be 0. To determine whether we have a maximum, a minimum or neither when $\frac{d^2y}{dx^2}=0$, higher derivatives must be considered.

The definition of the maxima and minima of a function of two variables is obvious. It is clear that a necessary condition for a maximum or minimum of $f(x, y)$, at a point where its partial derivatives are continuous, is that $\frac{\partial f}{\partial x} = \frac{\partial f}{\partial y} = 0$. A sufficient condition for a maximum is $\left(\frac{\partial^2 f}{\partial x \partial y}\right)^2 < \left(\frac{\partial^2 f}{\partial x^2}\right)\left(\frac{\partial^2 f}{\partial y^2}\right)$ and $\frac{\partial^2 f}{\partial x^2} < 0$. A sufficient condition for a minimum is $\left(\frac{\partial^2 f}{\partial x \partial y}\right)^2 < \left(\frac{\partial^2 f}{\partial x^2}\right)\left(\frac{\partial^2 f}{\partial y^2}\right)$ and $\frac{\partial^2 f}{\partial x^2} > 0$.

Some important theorems in plane geometry having to do with maxima and minima are that of all polygons having a given perimeter and a given number of sides the regular one has the greatest area; that a circle has a greater area than any other figure with the same perimeter; that a right triangle is larger than any other with two sides equal to its legs, and that of all triangles with a given perimeter and a given base, the isosceles is the greatest. See CALCULUS, THE INFINITESIMAL; CALCULUS OF VARIATIONS.

MAXIMALISTS, or BOLSHEVIKI, the name applied to the adherents of the extreme Socialist party which, headed by Lenine and Trotzky, overthrew the provisional government and the Soviet leaders in Russia on 7 Nov. 1917. The words "Bolshevik" (sing.), "Bolsheviki" (plural) and "Bolshevism" are not explanatory terms and have nothing to do with the policy or aims of the party. Their origin dates from the second conference of the Russian Social-Democratic party in 1903, at which the methods to be adopted in regard to revolutionary activity were under discussion. A sharp line of cleavage made itself evident; and when voting on the resolutions took place there was naturally a majority (bolshinstvó) and a minority (menshinstvó). From that moment the groups were called Bolsheki and Menshiviki (maximalists and minimalists). The majority represented the extremists, the "whole-hoggers" of Socialism (bólshĕ — more), or those who go for the biggest things; while the minority represented the "moderates" or "thin-end-of-wedge" theorists (ménshi — less, smaller), or those whose aims are of smaller intent. There appears to be no evidence that the terms existed or were current before 1903, though the Russian Social-Democratic party was founded by Plekhanov and others in Switzerland in 1884. The abortive revolutionary movement of 1905–06, which opened with the Putilov ironworks strike and the Father Gapon episode, served to widen the breach between the two factions to the extent that in 1907 the party was definitely split into two independent groups — Bolsheviki and Menshiviki. The former, following in part the teachings of Karl Marx, were led by Lenine. The Marxian revolution was essentially a class revolution, to the realization of which nationalism was regarded as an obstacle. The European War and the aftermath of the Revolution of March 1917 revealed the wide divergence existing between the aims and methods of the two groups. The Bolsheviki contracted the class distinction to narrower dimensions and looked upon the educated classes, the *bourgeoisie*, and even the peasants as enemies. Their aim was radical internationalism; they sought not the re-creation of Russia, but the triumph of one class throughout the world — the proletariat; in other words, mob-rule. For the most part they were bitter and arid doctrinaires, reeling off strings of long, high-sounding words and phrases which few understood, and clinging to a vague and abstract creed with fanatical devotion. Every problem was met by a reference to the letter of their law and interpreted accordingly. But whatever political, social or economic creed the Bolsheviki professed on paper, their activity — and by that alone can they be judged — consisted merely of a wild orgy of crime, plunder and treason. No trace of practical ability was revealed by any of their leaders, but they had the driving force which even the shallowest fanaticism can give. They were opposed to the war, which they declared to be "imperialistic" and "bourgeoise." They were opposed (on principle) as much to a German peace as to a peace dictated by the Allies: "No indemnity, no reparation and no annexation" became their ideal. The Menshiviki were of a saner type; while claiming for the working classes the importance due to their numbers, they did not ignore other classes. Holding in view definite practical reforms, they were willing to utilize the existing machinery of the state for their purpose. They accepted the war and its vigorous prosecution as a part of their program and realized that nationalism must precede internationalism. They recognized that the cause of the Allies was also their cause, and in this belief they were undoubtedly supported by the more intelligent Russian Social-Democrats. To the Bolsheviki the fate of their country mattered nothing, provided only that their own crude ideas of social reconstruction survived the ordeal. They were eager for peace on any terms in order that they might proceed with their own program, that class war which recognized no political frontiers nor national consciousness. After the fall of Kerensky the Bolsheviki began their career as rulers by the wilful and systematic destruction of the Russian army and navy. Their leaders posed before the world as the elect champions of a new idealism which was to redeem mankind. They proposed to teach other democracies the true and saving doctrine of the real revolutionary creed. Of exercising government, as that term is understood among civilized peoples, they proved themselves utterly incapable; government, in fact, holds no place in their system, of which the sole principle is civil war or, as they term it, "class war." Though it owes its genesis to Socialism (from which it is really far removed), Bolshevism may be described as a com-

pound of anarchism, syndicalism, hatred and blind fanaticism. Needless to say, ingredients of this type cannot fail to attract all the purely criminal elements which, in normal times, are held in check by the forces of law and order. With the removal or breakdown of that salutary check and the absence of an efficient substitute, a free rein is given to unbridled passions by which a political movement is converted into a mere carnival of terrorism. This was what happened in Russia in 1917. The Bolsheviki had nothing whatever to do with bringing about the revolution which swept away the autocracy in March of that year. That revolution was neither engineered nor organized; it sprang not from the burning inspiration of a new faith, but succeeded almost automatically from sheer weariness: tired in mind and body, Russia had lost nerve and heart. The provisional government that was formed on 16 March consisted of honest, patriotic and intelligent men — Prince Lvov, Guchkov, Milyukov, Terestchenko, Nekrasov, Shingarev and Kerensky, who was the only Socialist in the group. Of all these, Kerensky proved to be the only "man of destiny" with sufficient magnetism to compel a following. Their first energies were devoted to maintaining discipline in the army and to carry the war to a successful conclusion. But already in September 1915 Lenine had issued the Zimmerwald manifesto, signed by himself and the Swiss Socialist, Robert Grimm, calling for "peace without annexations or indemnities." German agents had sedulously spread this doctrine among the Russian rank and file. with the result that the idea of a peace so easily to be gained soon won a large number of converts. It was easy for German propagandists to convert the working classes to this view. The people were told what they wanted to hear — that it was folly to fight longer and that their Western Allies were the true foes of Russia, since they sought to force her to remain in the war. Not only did demoralization of the army set in, but there also grew up a spirit of hostility against the Allies, especially Great Britain. Thus, while the provisional government and later Kerensky alone struggled to maintain order and national unity, Bolsheviki and German agents were undermining the structure with glowing promises and sedition. On 16 July 1917 the Bolsheviki in Petrograd, led by Lenine and Trotzky, attempted to seize the reins of government and failed. Lenine disappeared when warrants were issued for the arrest of the Bolshevist leaders. At the last moment Kerensky weakened; regarding the Bolsheviki as "political opponents," he countermanded the order for their arrest.

Up to this time the Russian armies were still fighting in the field; their offensive in Galicia was nearing its disastrous climax and Bolshevism — the foe of the revolution and an enemy of the people — was growing in momentum. Confusion spread; Kerensky denounced the counter-revolutionists and those who unwittingly encouraged anarchy (Moscow, 25 Aug. 1917), which caused a wider split among his uneasy team. General Korniloff arrived from the front and stated that the military disasters were due not to the revolution but to the follies of the revolutionaries; that discipline must be maintained both at the front and in the rear. His gloomy picture of a degraded and defeated Russia had no terrors for the Bolsheviki. After three days of palaver the conference talked itself to a standstill with no result. Meanwhile, the German armies found no difficulties in overrunning northern Russia and seizing Riga. Kerensky again wavered. His fatal error in the Korniloff affair drove the few remaining moderates out of his Cabinet and gave the Bolsheviki their opportunity. The retreating Russian armies gave themselves up to pillaging their own people and the sailors of the Baltic fleet murdered their own officers. Lenine crept out of hiding and raised his voice afresh in Kronstadt — the worst nest of anarchy. Kerensky once more fulminated against the Bolsheviki and then informed the United States that Russia was worn out. The dark forces waiting in the shadows quickly observed the change and made their preparations. The apathy and despair of Russia made her an easy victim to a body of determined men. Trotzky, then president of the Petrograd Soviet, summoned the proletariat of all nations to do what had been done in Russia; he decided to make peace with a willing Germany and to raise his party to the supreme power. On 5 Nov. 1917 the Military Revolutionary Committee ordered the Petrograd garrison to place itself under their instructions. Kerensky suppressed the chief Bolshevist paper and called on the loyal troops to defend the government. On the 6th the military cadets occupied stations, bridges and telegraph offices and threw a cordon around Kerensky's residence, the Winter Palace. Lenine arrived the following day with his leading spirits and made the Smolny Institute (a girls' school) the Bolshevist headquarters. He issued a proclamation announcing the fall of the government. The majority of the troops went over to the Bolsheviki. Kerensky fled on the 7th, leaving a guard of cadets and some women at the Palace. The Bolshevist troops (Red Guards) captured the palace, committed many brutalities on the inmates and in a few hours the whole of Petrograd was in their hands. The "new government" was placed in the control of a "Council of People's Commissioners," of which Lenine was appointed president, Trotzky Foreign Minister and Ensign Krylenko as commander-in-chief of what was left of the army.

The comparative ease with which the Bolsheviki overturned the provisional government was due mainly to the passive attitude of the troops. Had Kerensky had at his disposal a few brigades of reliable troops he might as easily have crushed Bolshevism on the same day. On 8 November Lenine telegraphed to all the belligerent governments a proposal for a three months' armistice. On the 10th a series of decrees began to emanate from the Smolny Institute, their principal features being the spoliation of one class and the transference of its property to another. Municipalities were empowered to sequestrate all houses, whether inhabited or not, and to instal in them citizens possessing no abode or occupying crowded or insanitary dwellings. All factories were passed to the possession of the operatives (syndicalism), and a moratorium was proclaimed for the payment of rent for small houses and lodgings. The most important decree threatened civil war in the rural districts by declaring all private ownership in land to be annulled without com-

pensation to the owners. The land was to be nationalized and handed over to the cultivators, while for the present all lands belonging to the state, to the Church and to monasteries, etc., with all appurtenances — flocks, herds, machines, etc., were to be placed at the disposal of the local agrarian committees until the meeting of the Constituent Assembly. The local soviets were authorized to preserve order during the process of confiscation. All mines, forests and waterways were acquired by the state, and the smaller woods, rivers and lakes were to be the property of the village communes. The gloom of Bolshevism had settled over Russia. Missionaries of that cult were dispatched to all European countries and to the United States to spread the faith and incite proletariat uprisings, though with negligible success. During 1918 the dread of "Bolshevism" became a haunting spectre to not a few governments. Everywhere outside of Russia it was denounced by public men and its slightest symptoms rigorously suppressed. It is a remarkable fact that, while Jews formed a large percentage of the leading Bolsheviki, over 90 per cent of Russian Jews were hostile to them. Many of them had lived in America, Switzerland, Great Britain, France, Germany and the Scandinavian countries. They returned to Russia after the Revolution, where their ranks were swelled by large numbers of exiles from Siberia — not all political offenders, but also some of the most dangerous criminals. (The further adventures of the Bolsheviki régime are told under RUSSIA — HISTORY; see also RUSSIAN REVOLUTION OF 1917; WAR, EUROPEAN; KERENSKY; KORNILOFF; TROTZKY; LENINE). Consult Trotzky, L., 'The Bolsheviki and World Peace' (New York 1918); *The World's Work* (New York, October 1918); *Current History* (New York, November–December 1918).

MAXIMIANUS I, măk-sĭm-ĭ-ā'nŭs, **Marcus Aurelius Valerius,** Roman emperor: d. February 310 A. D. He so approved himself by his services in the army that Diocletian selected him for his colleague, creating him first Cæsar (285), then Augustus (286) and at the same time conferred on him the honorary appellation of Herculius. Maximianus had the care of the Western Empire, while Diocletian undertook that of the Eastern. In 287 he was consul with Diocletian, and in the same year conducted a campaign in Gaul. After conducting several wars, in 303–304 he was for the seventh time made consul, having for his colleague Diocletian for the fifth time, with whom he abdicated 1 May 305. In the following year he was again invested with the imperial title by his son Maxentius, to whom his services against Severus and Galerius were of the most important kind. His son shortly after expelled him from Rome, and repairing to Gaul, in 308 caused himself to be proclaimed Augustus at Marseilles, but Constantine easily deposed him. See CONSTANTINE; DIOCLETIAN.

MAXIMILIAN I, măk-sĭ-mĭl'ĭ-ăn (Ger. măks-ē-mē'lē-ān), emperor of Germany: b. Neustadt, near Vienna, 22 March 1459; d. Wels, in Upper Austria, 12 Jan. 1519. He first became an independent prince by his marriage with Mary of Burgundy, the daughter of Charles the Bold, who died in 1477. This match involved him in a war with Louis XI, King of France, in which he was successful, though he was defeated at a later period by the Milanese. At Frankfort in 1486 he was chosen king of the Romans and two years later was imprisoned by the Flemings at Bruges. He secured the Tyrol in 1490 and in the same year made war against Charles VIII of France. In 1493 he became Holy Roman emperor on the death of his father. He was involved in war with Venice, France and Switzerland for the greater part of his reign. He was succeeded by his grandson, Charles V. Consult 'Cambridge Modern History' (Vol. I, 1903), and Heyck, 'Kaiser Maximilian I' (Bielefeld 1898).

MAXIMILIAN, emperor of Mexico, known in earlier life as Ferdinand Maximilian Joseph, Archduke of Austria: b. Vienna, 6 July 1832; d. Queretaro, Mexico, 19 June 1867. He was the younger brother of Francis Joseph I, emperor of Austria (q.v.). He entered the Austrian navy in 1846, and in 1854 obtained the rank of rear-admiral and was placed at the head of the Austrian marine. He was viceroy of the Lombardo-Venetian kingdom in 1857–59, and in 1857 married Princess Charlotte of Belgium, daughter of King Leopold I. On his return from a voyage made to Brazil for scientific purposes he fixed his residence at Miramar in the vicinity of Trieste, and there, 3 Oct. 1863, received a deputation from the Mexican Assembly of Notables, who offered him the crown of their country. He officially announced his acceptance 10 April 1864. He landed at Vera Cruz on 28 May and entered Mexico on 12 June. He set himself energetically to consolidate and develop his dominions, granted an amnesty to political offenders and exhibited great interest in religious worship and education. But he failed to conciliate the Republican party, and as he did not restore to the clergy their confiscated estates they pronounced him a traitor. Meanwhile there were incessant conflicts between the partisans of President Juarez and the allied French and imperial troops; and the decree of 2 Oct. 1865, by which the members of the Juarist bands and those who abetted them were to be regarded as bandits and shot, alienated the party of the Liberals. Juarez raised the standard of independence. Complications and misfortunes thickening around Maximilian rendered his position critical in the extreme. The empress in vain undertook a mission to Europe to enlist support for her husband, and grief and disappointment overthrew her reason. The French troops, largely by reason of the representations of the United States government, were withdrawn by Napoleon in March 1867; but Maximilian decided to remain in the hope of being able to maintain the empire. While bravely defending Queretaro against a Liberal force under Escobedo, he was betrayed by General Lopez on the night of 14 May 1867. Tried by court-martial, he was sentenced, with his principal officers, to be shot. The sentence was carried into effect on the morning of 19 July. Maximilian's body was after some delay surrendered to his relatives, and his funeral was celebrated with great pomp in the cathedral of Vienna on 18 Jan. 1868. Maximilian was a man of eminent abilities and high and varied culture. His collected writings are contained in a posthumous publication entitled

'Aus meinem Leben: Reiseskizzen, Aphorismen, Marinebilder' (1867), which gives ample testimony to the vigor of his intellect and the variety of his attainments. (See MEXICO, *History*). Consult Bancroft, H. H., 'History of Mexico' (6 vols., San Francisco 1883–88); 'Cambridge Modern History' (Vol. II, New York 1909); Kemper, J., 'Maximilian in Mexico' (Chicago 1911); Martin, P. F., 'Maximilian in Mexico' (London 1914).

MAXIMILIAN, Joseph, 1st king of Bavaria: b. Schwetzingen, Baden, 27 May 1756; d. Nymprenburg, near Munich, 13 Oct. 1825. He succeeded his uncle, Charles Theodore, as elector in 1799. He was a supporter of Napoleon, and gave his daughter in marriage to Eugene Beauharnais in 1806. In the same year his duchy was erected into a kingdom. In 1813, however, he was member of the league against the emperor, and thus retained his throne after the fall of Napoleon. His reign was distinguished by the introduction of many administrative reforms, especially the constitution of 1818.

MAXIMINUS, măk-sĭ-mī'nŭs, **Caius Julius Verus,** Roman emperor: d. Aquileia, 238 A.D. He was at first a shepherd in Thrace and when about 20 years of age became a soldier in the Roman armies, where he was distinguished by his gigantic stature. His capacity for fighting procured him rapid advancement, and under Alexander Severus he had the command of a legion on the Rhine. In 235 A.D. he took part in a conspiracy against Alexander, and after his murder of the latter by the soldiers was proclaimed emperor. The Gordiani having been proclaimed in Africa, Maximinus hastened to Italy and laid siege to Aquileia. He was there murdered by his soldiers.

MAXIMITE, a high explosive employed as a bursting charge for projectiles, invented by Hudson Maxim (q.v.) of New York City. The secret of the invention and the exclusive right to the use of the explosive was purchased by the United States government in 1901, after very exhaustive trials at Sandy Hook proving grounds. Maximite was the first high explosive to be successfully employed as a bursting charge for armor-piercing projectiles. This explosive, while it is claimed to be 50 per cent more powerful than ordinary dynamite, is so insensitive that it will not only safely withstand the shock of discharge from the gun, but will also stand the far greater shock of penetrating armor-plate as thick as the projectile containing it is capable of passing through, the projectile being then exploded immediately behind the plate with a delay action detonating fuse.

Ignited in the open, maximite simply burns like pitch. Projectiles are charged with it by the simple process of melting and pouring, the explosive solidifying on cooling, and adhering firmly to the walls of the shell. Maximite is known to be a picric acid compound. See EXPLOSIVES; PROJECTILES.

MAXIMS. The 'Maxims' of La Rochefoucauld furnish the most famous body of examples of that polished and studied condensation of expression to epigrammatic sparkle and brilliance in which the French so delight and so excel, and of which the 'Pensées' of Pascal, the 'Caractères' of La Bruyère and the 'Reflexions' of Vauvenargues are other specimens. They are precisely what their fuller official title proclaims them: Reflections, or Sentences and Moral Maxims ('Réflexions, ou Sentences et Maximes morales'). They are moral in the sense that they are concerned with the facts of human conduct and motive, but not at all in the sense of serving a didactic purpose or in proposing an incentive or a guide to virtuous living; and they are reflections rather than maxims in the ordinary meaning of the word, since what they give us is not practical precept and counsel, but an analysis of moral facts. In this analysis the sharp distinction and opposition between vice and virtue disappears. His moral philosophy is summed up in the maxim that stands as epigraph at the head of the collection: "Our virtues are most frequently but vices disguised." The idea is restated a little more specifically in the first reflection: "What we term virtue is often but a mass of various actions and divers interests which fortune, or our own industry, manage to arrange, and it is not always from valor or from chastity that men are brave, and women chaste." The root of all our actions, mask it as we will, is selfishness. This view of virtue and vice may owe something of its bitterness and pessimism to the personal temper of La Rochefoucauld, soured by disappointment after playing a restless and unsuccessful part in political and private intrigue. But it owed much also to his penetrating observation of the life of court and salon, and even those who wanted to think more generously of human nature admitted sadly the accuracy of his analysis, while all were captivated by the concision and elegance of his style. To this he gave unending care, polishing and refining his sentences, rejecting some and adding others in successive editions (1665, 1666, 1675, 1678). The standard edition is that prepared by M. Gilbert (Paris 1868). The Maxims have had many admirers among English writers, as Addison, Swift, Dr. Johnson and Lord Chesterfield. They have often tempted to translation. A late and complete English version is by J. W. Willis Bund and J. Hain Friswell (London 1871).

ARTHUR G. CANFIELD.

MAXIMS, Legal, epigrammatic statements of established principles in law, as "Ignorance of the law excuses no one" (*Ignorantia legis neminem excusat*). They are of historic and practical value, and are common in both law and equity. Usually they are given in Latin or in English, but occasionally they appear in French. The following are some of the most important which appear generally in English: "Equity treats that as done which ought to be done"; 'He who comes into equity must come with clean hands"; "Who seeks equity must do equity"; 'Acts indicate the intention"; "Where there is equal equity, the law must prevail." The following usually appear in Latin: *Qui facit per alium facit per se* ("He who acts through another acts himself"—important in the law of agency); *Affirmantis est probare* ("He who affirms must prove"); *Causa proxima non remota spectatur* ("The immediate and not the remote cause is to be considered"—important in the law of torts). While maxims are of importance in the law to-day, it is nevertheless true that some of them, through legal changes, are practically obsolete. Due

allowance also must be made for the fact that they do not contain exceptions and amplifications of the principles they state; otherwise they are very likely at times to be misleading.

MAXIMUM DUTIES. See DUTY.

MAXIMUS MAGNUS, Roman emperor: b. in Spain; d. 388. In 383, while commanding the Roman army in Britain, he proclaimed himself emperor. Gratian marched against him, but was defeated and assassinated, and Maximus, having made himself master of Gaul, Britain and Spain, fixed the seat of his empire at Treves. He then advanced into Italy and was besieged in Aquileia by the Emperor Theodosius, who caused him to be beheaded.

MAXWELL, SIR Herbert Eustace, 7th Baronet of Monreith, Scottish author: b. Edinburgh, 8 Jan. 1845. He was educated at Oxford, was Conservative member of Parliament for Wigtownshire, 1880–1906, and president of the Society of Antiquaries of Scotland, 1900–13. Among his many publications are 'Noontide Essays' (1892); 'Scottish Land Names' (1894); 'Rainy Days in a Library' (1896); 'Life of the Duke of Wellington' (1899); 'Memories of the Month's' five series (1900–09); 'The House of Douglas' (1901); 'Memoirs of George Romney' (1902); 'The Creevy Papers' (1903); 'A Century of Empire' (1909–11); 'The Making of Scotland' (1911); 'Fishing at Home and Abroad' (1914); 'Trees, A Woodland Notebook' (1914).

MAXWELL, James Clerk-, Scottish natural philosopher: b. Edinburgh, 13 Nov. 1831; d. Cambridge, England, 5 Nov. 1879. He was educated at Edinburgh and at Trinity College, Cambridge, and in 1856 was appointed professor of natural philosophy in the Marischal College, Aberdeen, and held that office till its amalgamation with King's College to form the University of Aberdeen in 1860, when he was appointed to a similar chair in King's College, London. In 1857 he obtained the Adams prize at Cambridge for an essay 'On the Stability of Motion of Saturn's Rings.' From 1855 to 1872 he published his investigations on 'Perception of Color, and Color Blindness,' which obtained for him the Rumford medal and his election as F.R.S. He resigned his chair in 1865 and in 1871 was elected unopposed to the newly-founded chair of experimental physics at Cambridge. He directed the formation of the Cavendish laboratory founded by the Duke of Devonshire and opened in 1874. In 1871 he published his 'Theory of Heat,' which has gone through several editions. In 1873 appeared his great work, 'Electricity and Magnetism.' Maxwell's fame will rest on his being the one who took the first grand step toward the discovery of the true nature of electrical phenomena. He rejected the theory of electrical "action at a distance," and sought to explain all electrical and magnetic phenomena as the results of local strains and motions in a medium whose contiguous parts only act on one another by pressure and tension. His scientific papers have been collected by W. D. Niven (1890). Consult Campbell and Garnett, 'James Clerk Maxwell' (London 1882); Glazebrook, R. T., 'James Clerk Maxwell and Modern Physics' (ib. 1896).

MAXWELL, William Henry, Irish-American educator: b. Stewartstown, Tyrone, Ireland, 5 March 1852. He was graduated at Galway Queen's College in 1872, and two years later received the degree of A.M. In 1874 he came to the United States. After eight years as teacher in Brooklyn he became assistant superintendent of schools in that city in 1882 and superintendent from 1887 to 1898. Since 1898 Dr. Maxwell has been superintendent of public schools of Greater New York. In this position he often came into conflict with members of the board of education. He advocated a college training for teachers and raised the requirements for teachers' examinations in New York. He was president of the National Education Association in 1905. Dr. Maxwell has always been deeply interested in the promotion of the study of English. He published 'Elementary English Grammar'; 'School Grammar' and other educational works.

MAY, Phil, English illustrator: b. Leeds, 22 April 1864; d. Saint John's Wood, London, 5 Aug. 1903. He was son of an engineer; had his schooling in Leeds; was apprenticed there to a lawyer, whom he soon left to join a company of players; for them he designed posters; married at the age of 19; and in 1884 and 1885 began drawing for *Society* and *Saint Stephen's Review*. He went out to Sydney, Australia, in 1885, where he gained some fame as artist of the *Bulletin*, and was forced by the exigencies of newspaper illustration to a very scanty use of line and a complete omission of anything else; went to Paris; returned to his work on *Saint Stephen's Review;* then began to draw for the *Daily Graphic;* in 1888 returned to England; thereafter traveling through America; and shortly after Du Maurier's death was taken on the staff of *Punch*. He must rank with Leech, Tenniel and the other great British caricaturists. His art was remarkably simple and telling, his method, it is said, being to reduce an elaborate and detailed drawing to the fewest possible lines. He was particularly happy in his portrayals of London street-life, which are full of humor and sympathy; his Parliament sketches are less felicitous and a misapplication of his talent. His own hatchet face, "banged" hair and ever-present cigar figure in many of his sketches. From 1892 to his death he published 'Phil May's Annual.' His other collections of drawings are 'Parson and Painter' (1891); 'Phil May's Sketch Book' (1895) and 'Phil May's Gutter-Snipes' (1896); 'Phil May's Graphic Pictures' (1897).

MAY, Samuel Joseph, American reformer and abolitionist: b. Boston, Mass., 12 Sept. 1797; d. Syracuse, N. Y., 1 July 1871. He was graduated at Harvard in the class of 1817, and after studying theology under Dr. Ware at the Harvard Divinity School became a Unitarian clergyman and in 1822 accepted a call to a church at Brooklyn, Conn. He was interested in the anti-slavery cause and preached as well as wrote in favor of it, advocating immediate emancipation, for which he was mobbed and burned in effigy at Syracuse in 1830. He was a member of the first New England Anti-Slavery Society, formed in Boston in 1832, and eagerly championed Prudence Crandall, when she was persecuted and arrested for receiving colored girls into her school at Canterbury, Conn. Mr. May was also a member of the Philadelphia convention of 1833 which formed the American

Anti-Slavery Society, and was one of the signers of the «Declaration of Sentiments,» the author of which was William Lloyd Garrison. For 18 years he was the general agent of the Massachusetts Anti-Slavery Society, and as such lectured and traveled extensively. He was five times mobbed while on a lecture tour in Vermont, in 1835, once while lecturing in the capitol at Montpelier. He had charge of the Unitarian church at South Scituate, Mass., from 1836 to 1842, becoming in the latter year, at the request of Horace Mann, the principal of the Girls' Normal School at Lexington, Mass. In 1845 he became pastor of the Unitarian Society at Syracuse, N. Y., which position he retained until 1868. Mr. May assisted in the rescue of Jerry, the slave, in 1851, and with several others was arrested for this offense against the Fugitive Slave Law. May and his associates issued a declaration in which they admitted the fact of their being implicated in the rescue, but claimed that the Fugitive Slave Law was unconstitutional and wicked. Realizing the changing sentiment in the North the authorities never brought the case to trial. May's life, like that of many another Abolitionist, was often in danger. He was among the most conservative anti-slavery leaders in his methods and was prominent also in many educational and charitable enterprises, and did a great deal toward improving the public-school system of Syracuse. By his associates May was termed the Saint John Apostle of the Gospel of Freedom, on account of his gentle voice and manner. He was both gentle and firm, courageous, unwearied and unselfish in the anti-slavery cause. He published 'Education of the Faculties' (1846); 'Revival of Education' (1855); 'Recollections of the Anti-Slavery Conflict' (1868). Consult Mulford, 'Memoir of Samuel Joseph May' (Boston 1873; new ed., 1882).

MAY, Thomas, English dramatist and historian: b. Mayfield, Sussex, 1594; d. London, 13 Nov. 1650. He was educated at Cambridge, became a member of Gray's Inn, but never practised, and figured brilliantly at court. He published 'Antigone,' 'Cleopatra,' 'Agrippina' and other dramas and translations of the 'Georgics' and Lucan's 'Pharsalia.' He was an intimate of Charles I and at the latter's behest wrote histories of Edward III and Henry II in verse. He espoused the cause of Parliament in the Civil War, was made secretary and historiographer to Parliament and wrote 'History of the Parliament of England, 1640–43' (1650; several times republished), and a 'Breviary' of the same history (1650). Until the Restoration his body reposed in Westminster Abbey, but as in the case of other Parliamentarians, it was then dishonored and thrown into a neighboring pit.

MAY, Thomas Erskine, Baron Farnborough, English historian: b. London, 8 Feb. 1815; d. Westminster, 17 May 1886. He was educated at Bedford Grammar School, became assistant librarian to the House of Commons in 1831 and was called to the bar in 1838. He was appointed examiner of petitions for private bills in 1846 and clerk to the House of Commons in 1871. He was knighted in 1866, and just prior to his retirement from office in 1886 was raised to the peerage. He is best known as an antiquarian and historian. His chief works are 'A Practical Treatise on the Law, Privileges, Proceedings, and Usages of Parliament' (1844; 10th ed., much enlarged, 1893), a model of its kind, which has been translated into most modern languages; 'Constitutional History of England since the Accession of George III, 1760–1860' (1861–63; republished with supplementary chapter, 1871); 'Democracy in Europe: a History' (1877). In 1854 he collected and reduced to writing the 'Rules, Orders, and Forms of Procedure of the House of Commons.'

MAY, the fifth month of the year, having 31 days. It was second in the old Alban calendar, third in that of Romulus and fifth in that of Numa Pompilius. The etymology of the word is doubtful. It was called Maius by Romulus, in respect to the senators and nobles of his city, who were called Majores, as the month following was called Junius, in honor of the youth of Rome who served him in war and were named Juniares. Some etymologists are of opinion that it was called Maia, from the goddess of that name, the mother of Mercury, to whom they offered sacrifices on the first day of the month. The sun enters Gemini during May and the plants of the earth generally begin to flower. See Calendar.

MAY APPLE. See Mandrake.

MAY BEETLE, or **JUNE BUG,** popular names for the clumsy brown beetles of the genus *Lachnosterna* (family *Scarabæidæ*) common throughout the United States. The adults fly by night during late spring and often are troublesome upon the young foliage of trees and shrubs. They are attracted by light and may be trapped in this way. The larvæ are large, brown-headed, white-bodied grubs which feed upon the roots of grass, etc., passing one or more years in the ground. For this reason strawberries and other crops which they attack should not be planted upon freshly-turned sod land. Late fall plowing is often practised to destroy them.

MAY-BIRD, a gunner's name for various shore birds which return from the South in the month of May, especially the knot (q.v.). In New England the black-bellied plover, and in the South a curlew, are called May-birds or May-cocks.

MAY CHERRY, a local name for the service-berry bush. See Amelanchier.

MAY DAY, popular name of the first day of the month of May, on which from a very early period general festivities took place. May has generally been regarded as a time for gladness. The outbreak into new life and beauty which marks nature instinctively excites. The first emotion is a desire to seize some part of that profusion of flower or blossom which spreads around, to set it up in decorative fashion and to let the pleasure which it excites find expression in dance and song; and among pagans the tendency has been to render to this vegetative trophy a sort of homage. Among the Romans, the feeling of the time found vent in their *Floralia,* or Floral Games, which began on 28 April and lasted to 3 May. Among the old Celtic peoples, a festival called *Beltein* (Baal's fire) also was held on this day, but it does not seem to have been connected with flowers, but rather with sun-worship. In Christian times in the Celtic countries the Church

Christianized this celebration by transferring it to 24 June, the feast of Saint John, which is still celebrated with bonfires. In England, as we learn from Chaucer and other writers, it was customary, during the Middle Ages, for all, both high and low — even the court itself — to go on the first May morning at an early hour "to fetch the flowers fresh." Hawthorn branches also were gathered; these were brought home about sunrise, with accompaniments of horn and tabor, and all possible signs of joy and merriment. The people then proceeded to decorate the doors and windows of their houses with the spoils. By a natural transition of ideas, they gave the hawthorn bloom the name "the May"; they called the ceremony "the bringing home the May"; they spoke of the expedition to the woods as "going a-Maying." The fairest maid of the village was crowned with flowers as the "Queen of the May"; placed in a little bower or arbor, where she sat in state, receiving the homage and admiration of the youthful revellers, who danced and sang around her. This custom of having a May queen seems a relic of the old Roman celebration of the day when the goddess Flora was specially worshiped. How thoroughly recognized the custom had become in England may be illustrated by the fact that in the reign of Henry VIII the heads of the corporation of London went out into the high grounds of Kent to gather the May — the king and his queen, Catharine of Aragon, coming from their palace of Greenwich, and meeting these respected dignitaries on Shooter's Hill. But perhaps the most conspicuous feature of these festive proceedings was the erection in every town and village of a fixed pole — the May-pole — as high as the mast of a vessel of 100 tons, on which, on May morning, they suspended wreaths of flowers, and round which the people danced in rings nearly the whole day. A severe blow was given to these merry and often wild revels, by the Puritans, who, in their campaign of taking the joy out of life, caused May-poles to be uprooted and a stop put to all their jollities. They were, however, revived after the Restoration and long held their ground, but the celebration is now confined to school children, their elders not taking part, so much has our modern industrial feudalism absorbed the leisure time of all but the parasite classes. In France, Germany and other countries, May-poles were common and festive sports are even yet observed. The Roman Catholic Church, in order to counteract the evils too often incident to the celebration of May Day, appears to have instituted the feast known in France as *La Fête-Dieu*, celebrated with processions and flowers. In America May Day celebrations have come into favor in the present century and in nearly all public parks of great cities games and processions are held. Consult Strutt, J., 'Sports and Pastimes of the People of England' (London 1801).

MAY-FLY, SHAD-FLY, or **DAY-FLY,** members of the order *Ephemeridæ*. The species, of which about 300 have been described nearly one-third of which are North American, are fragile insects with large fore-wings, small or wanting hind-wings, short antennæ, atrophied mouth parts and two or three thread-like abdominal filaments. Being greatly attracted to lights, the adults are often a source of annoyance in lakeside and riverside towns, and are sometimes especially troublesome in obscuring the lights from lighthouses. The eggs are laid in fresh water either upon the surface or upon the bottom, the female diving for this purpose. The larvæ, which feed mainly upon vegetable matter, are active creatures with strong legs, abdominal tracheal gills and anal appendages. They live upon the bottom, under stones, covered with mud, or in burrows. After moulting about 10 times wing pads appear, and these increase with each moult until the last, which may be number 20. This occurs in the open air, the one previous to which occurs at the surface of the water, the insect escaping from its subimago skin rather suddenly. One striking difference the adults exhibit is the development of paired sexual organs, which do not appear in other orders of insects. The larvæ may take three years to develop; the adults live only a few days, lay their eggs and die. Both adults and larvæ are important food for fishes, and consequently they form a favorite bait with anglers, and are imitated in making artificial flies.

MAYA, mā' ya", the ruling race of Yucatan at the time of the discovery of America and for many years previous. Where they came from is uncertain; but that they invaded the peninsula from two different directions is asserted in various of their traditions. This probably means that the people are of distinct races, one of which came by way of the Gulf of Mexico and the other from the west or southwest by land. The first influx of inhabitants to Yucatan recorded in the traditions was led by the great culture hero Zamná (q.v.) who became the first temporal and ecclesiastical ruler of the land, a sort of Moses, a giver of laws and a solidifier of traditions. Tradition says he lived to be quite old and that he divided the country into districts which he gave to his followers of noble birth. At the time of his death the Mayas were in secure and peaceable possession of the peninsula of Yucatan, throughout the length and breadth of which they had extended their culture. These early Mayas seem to have been closely connected with the other great cultured peoples of Chiapas, Honduras and Guatemala, in language, customs and religious institutions.

The second inroad of foreigners into Yucatan was, according to traditions, headed by Quetzalcoatl. This probably means that the newcomers were followers of the Toltec religion and probably possessors of Nahuan culture. Whether, on their arrival in Yucatan, they spoke the same language as the first Mayas is not known; but it seems probable that they did, since they are called, by various early writers, "the Itzas," a name generally conceded to mean the followers of Zamná or Itzamná, the culture god of the early Mayas. Yucatan now had two governing races which seem to have lived on more or less friendly terms with one another, and to have had no trouble in communicating with one another. It is certain that, at the time of the conquest of Yucatan, which took place about 500 years later, only one language existed in the country. Yet the style of the various ruins of Yucatan show that there must have been a blending of cultures and religious ideas, and indicates the

influence of Nahuan civilization in the peninsula. It is probable and there are intimations in the Maya and Quiché traditions, that not only one but numerous migrations took place over considerable periods of time from the southwest into Yucatan.

Both the original followers of Zamná and the immigrants from the southwest, Chiapas and Guatemala, must have been, as tradition pictures them, great builders for Yucatan is literally covered with ruins whose forms, decorations and peculiar characteristics show that at least two races of considerably different cultures built them. Yet however different may have been the cultures of these two peoples they appear to have become pretty well blended by the time of the conquest, and the two races had merged into one, which the Spaniard named Maya or sometimes Itza. Under the Tutul Xius at Uxmal (q.v.) the Mayas built a civilization noted for its splendor among all the neighboring nations. Uxmal became the greatest, most powerful, wealthy and artistic city in Yucatan and as such flourished for many years; but it was finally conquered; and Maya power was transferred to Mayapán, which in its turn fell into the hands of people from the mountains near the end of the 13th century. This was followed by a century and a half of civil war in the peninsula, which led finally to the destruction of Mayapán (q.v.) about 1460. In this war the Tutul Xius found their power greatly reduced and themselves driven to take refuge in Mani, a city which they still inhabited at the time of the Spanish conquest during the first half of the 16th century. With all these influxes of foreigners who evidently remained in the country, into which they appear to have continued to flood up to the time of the discovery of America, the language of Yucatan remained a unit, in which the dialects were so slightly marked that the people of the whole peninsula conversed with one another without any difficulty. This would seem to indicate that the Maya race was fundamentally the same as that which erected the great historic buildings now in ruins throughout the Quiché country, part of Honduras and the Mexican state of Chiapas. Their culture seems also to have been related to that of Oaxaca, Tabasco, Campeche and Guerrero. The territory of the Maya race proper stretched southward covering all the peninsula of Yucatan and reaching to the Pacific Ocean.

The Mayas had made a very great advance in civilization at the time of the discovery of America; though, owing to the long and bloody civil wars through which they had just passed, this civilization had lost much of its splendor. This was completely destroyed during the Spanish conquest, which lasted 16 years. Then many of the Mayas retreated to the hilly country and the deeply-wooded coast-land to the west where they continued to maintain their independence during the 300 years of Spanish rule. Numerous military expeditions were sent against them and it was not until the administration of Porfirio Diaz that they were reduced to comparative quiet, from which they have again more or less freed themselves. The Maya tongue is still spoken by about 300,000 persons, of whom about 100,000 are of mixed descent. See MEXICAN MYTHOLOGY and ETHNOLOGY, CHICHEN-ITZÁ. See also bibliography under YUCATÁN.

MAYAGUEZ, mä-yä-gwas', Porto Rico, a seaport city on the Mayaguez River near the west coast, the capital of Mayaguez department and third city of the island in size, 72 miles southwest of San Juan. The city was founded in 1752 and has a modern appearance, with wide streets, public plazas, fine buildings, electric lights and a street railway. A railway brings it into communication with the interior. It has a large but shallow harbor, and its port is three miles distant at Mayaguez Playa, where a considerable export trade in coffee, sugar and oranges is carried on chiefly with the United States. In the vicinity is the Porto Rico Agricultural Experiment Station, which dates from 1902. Pop. about 20,000.

MAYAPÁN, the ancient capital of the Maya kingdom in Yucatán. According to tradition it was founded by Zamná, the ancient highpriest, ruler and culture deity of the Mayas. Zamná divided the Maya kingdom among his leaders whose descendants formed the Maya nobility of Yucatán. In later days the Tutul Xiu, high nobles, became the ruling power under the sovereign, who was chosen from among them. Many years later Kukulcán, another traditional demi-god, according to traditional history, became king and high priest of Mayapán. As this name is a literal translation of the word Quetzalcoatl (q.v.), the name of the Nahuatl god of culture, and as the story of the latter and that told of Kukulcán are almost identical, it is probable that this tradition records the conquest of Mayapán by the Toltecs or some Nahuatl race who introduced into Yucatán the worship of Quetzalcoatl. According to the Maya traditional history this Kukulcán formed a confederacy of the rulers of Mayapán and Chichen Itzá, the latter the ruling party among the Itzas. Of this confederacy he seems to have been the pontifical head and the ruling spirit, though with him the other two sovereigns were legally joint rulers with equal powers. On his departure from Mayapán, which seems to be mythical, Kukulcán left the kingdom to princes known afterward as the Cocomes, under whose seven successive rulers Mayapán enjoyed a period of wonderful prosperity during which many cities throughout the country subject to this capital are supposed to have been built. The ruins of these ancient cities are still found in the vicinity of Mayapán.

In the meantime, the city of Uxmal (q.v.) rose to power in another part of the isthmus. In a sanguinary war with this latter Mayapán was finally defeated and destroyed. Uxmal became the head of a new confederacy, with the Tutul Xiu the ruling royal family. The latter ruled wisely and well at first and rebuilt Mayapán, which continued to flourish for several centuries. It was, however, finally razed to the ground about the middle of the 15th century, or shortly before the discovery of America, in a civil war in which the vassal lords fought against and finally overthrew the power of the Tutul Xiu dynasty. Thus finally disappeared Mayapán, the first of the known great and populous cities of ancient Yucatán.

The ruins of the city of Mayapán are situated about 25 miles south of Merida. The condition of these ruins to-day seems to bear

out the traditional history that this old capital of the Mayas was completely destroyed, for little of its past magnificence now remains standing. But numerous mounds, terraces and pyramids, badly ruined edifices and huge quantities of stone, sculptured blocks and foundations of buildings scattered over a considerable extent of territory are evidence of the existence of a great centre of population and a place of some magnificence. One great mound or pyramid over 69 feet high has a stairway 20 feet wide on each of its sides leading from the ground to the truncated summit, a stone-paved platform considerably wider than the stairway. Sculptured stone blocks lie scattered over an area of three miles, attesting the great extent of this ancient Maya capital which tradition says was once surrounded by a thick and high stone wall, but that this wall was razed to the ground at the time of the final destruction of the city about 100 years before the conquest of Yucatán by the Spaniards. Along the line of this wall runs an old ditch, now filled up with débris, and on both sides of this are vast quantities of stone supposed to have once formed part of this ancient rampart. See UXMAL; CHICHEN ITZÁ; YUCATAN.

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JOHN HUBERT CORNYN.

MAYBRICK, Michael ("STEPHEN ADAMS"), English composer: b. Liverpool, about 1845; d. 26 Aug. 1913. He studied music in Italy and Germany and was for many years a leading baritone vocalist in concerts and English opera. As a writer of songs over the signature "Stephen Adams," he was widely popular in this country and England. Among the best known of his many songs are 'The Midshipmite'; 'Nancy Lee'; 'Alsatian Mountains'; 'The Holy City'; 'A Warrior Bold.'

MAYENCE, mā-yŏns. See MAINZ.

MAYER, Alfred Goldsborough, American zoologist: b. Frederick, Md., 16 April 1868. In 1889 he was graduated at the Stevens Institute of Technology and at Harvard in 1897. From 1892 to 1900 he was assistant to Dr. Alexander Agassiz and had charge of radiates in the Harvard Museum of Comparative Zoology from 1895 to 1900. In 1900–04 Dr. Mayer was curator of natural sciences and curator-in-chief of the Brooklyn Institute Museum; in 1904–05 he was director of the marine laboratory of the Carnegie Institution, Tortugas, Fla., and since 1905 has been director of the department of marine biology at the Carnegie Institution, Washington. Dr. Mayer took part in several scientific expeditions in many parts of the world. Since 1913 he has been lecturer in biology at Princeton. He has published 'Medusæ of the World' (3 vols., 1910); and contributions to zoological publications, especially on the insects and medusæ and on chemical causes of animal movements; effects of ions upon rate of nerve conduction; studies of coral reefs of Samoa, etc.

MAYER, mā'ĕr, **Alfred Marshall,** American physicist: b. Baltimore, 13 Nov. 1836; d. Maplewood, N. J., 13 July 1897. He studied at Saint Mary's College, Baltimore; spent two years in a machine-shop and draughting-room; specialized in chemistry and physics; became professor of these branches in the University of Maryland (1856) and in Westminster College, Fulton, Mo. (1859); after two years of study in Paris was appointed to a chair in Pennsylvania College, Gettysburg (1865); went thence to Lehigh University in 1867; and from 1871 to his death was professor of physics in Stevens Institute, Hoboken, N. J. There he made important researches in acoustics; invented the topophone, an apparatus to detect the phases of sound vibration; discovered five methods of analysis of compound sounds into their elementary tones; and stated the law of tuning-fork vibration. He became a member of the National Academy of Sciences in 1872. He wrote many papers for the *American Journal of Science,* notably a series entitled 'Researches in Acoustics' and was at one time a member of the editorial staff; several contributions to the *Scientific American Supplement;* 'Lecture Notes on Physics' (1868); 'The Earth a Great Magnet' (1872); 'Light' (1877); and 'Sound' (1878). Consult *Science* (issue of 20 Aug. 1897).

MAYER, Brantz, American author: b. Baltimore, 27 Sept. 1809; d. there, 21 March 1879. He was educated at Saint Mary's College, Baltimore, studied law by himself during an Oriental voyage in 1827–28 and then at the University of Maryland; was admitted to the bar in 1829; and after a year in Mexico as secretary of legation wrote 'Mexico as it Was, and as it Is' (1844). In the same year he founded the Maryland Historical Society. In the Civil War he sympathized with the Union was president of the Union State General Committee, and from 1863 to 1871 paymaster in the United States army. His best book was 'Captain Canot,' a story of the slave trade founded on fact. He wrote also 'Mexico, Aztec, Spanish, and Republican' (1851); 'Observations of Mexican History and Archæology' (1856); 'Mexican Antiquities' (1858); 'Memoir of Jared Sparks' (1867); and 'Baltimore as it Was, and as it Is' (1871).

MAYER, Constant, American artist: b. Besançon, France, 4 Oct. 1832; d. 1901. A student at the School of Fine Arts in Paris, he left his studies in 1857 and settled in New York, where his sketches and portraits won immediate success. His portraits of Grant and Sherman and his life-sized genre paintings, such as 'Maud Müller'; 'The Song of the Shirt'; 'Evangeline,' gained favor. From 1866 he was an associate of the National Academy of Design and exhibited frequently at the Salon.

MAYER, Frank Blackwell, American artist, brother of Alfred Marshall Mayer (q.v.) and nephew of Brantz Mayer (q.v.): b. Baltimore, 27 Dec. 1827; d. 1908. He studied art there under A. J. Müller, and under Gleyre and Brion in Paris and then settled in Annapolis. He made a special study of Dakota Indian types; contributed to *Harper's* and *Century* various articles with his own illustrations; and exhibited in the Paris Salon and at the Centennial Exhibition of 1876, where he received a medal for two pictures, 'The Continentals' and 'Attic Philosopher.'. Among his other canvases are 'Feast of Mondawmin'; 'The King's Fool'; 'The Trappist'; 'Maryland in 1750'; 'Crowning a Troubadour,' 'The Treaty of Traverse des Sioux,' 'Minnesota' (1886); 'The Washington Cockade,' 'Founders of the Baltimore and Ohio Railroad' (1891; and 'The Burning of the Peggy Stuart.'

MAYER, Henry, American caricaturist: b. Worms, Germany, 18 July 1868. Educated in Germany and England, he at first followed a business career in the latter country, but emigrating to the United States in 1887 soon won for himself a distinct place as caricaturist, by his designs and illustrations for American and European papers. Since 1893 he has resided in New York. His works are 'Autobiography of a Monkey' (1896); 'In Laughland' (1899); 'Fantasies in Ha-Ha' (1899); 'A Trip to Toyland' (1900); 'Adventures of a Japanese Doll' (1901); 'Alphabet of Little People' (1901). He is the creator of 'Impressions of the Passing Show' for 10 years in the New York *Times*. He received a personal gift of two cloissonné vases with imperial crest from the late Mikado for his cartoons during the Russo-Japanese War. He is editor of *Puck* since 1914.

MAYER, mī'ĕr, **Julius Robert von,** German physicist: b. Heilbronn, Würtemberg, 25 Nov. 1814; d. there, 20 March 1878. He was educated at the gymnasium in Heilbronn, studied medicine at Tübingen and finished his university studies at Munich and Paris. In 1840 he went to Java as a ship's surgeon, and while there turned his attention to studies of the blood, extending his work to exhaustive investigations of animal heat, to which he applied the mechanical theory. Returning in 1841 to Heilbronn, where for some years he practised his profession, he became deeply engrossed with his scientific labors, and in 1842 published in Liebig's *Annalen der Chemie und Pharmacie* a preliminary statement of his revolutionary theory of heat, together with his views on the conservation and correlation of energy. Three years later he restated his results in 'Die organische Bewegung in ihrem Zusammenhange mit dem Stoffwechsel,' at the same time giving a forecast of his theory of the meteoric origin of the sun's heat. Contemporaneously with Mayer the mechanical theory of heat was worked out independently by J. P. Joule (q.v.) in England, and a controversy arose regarding the priority of discovery. The Royal Society gave Mayer the Copley medal in 1871, and two years before his death he was ennobled by the king of Würtemberg. His collected works appeared in 1867 under the title 'Die Mechanik der Wärme' (3d ed., by J. S. Weyrauch 1893). Consult Weyrauch, 'Robert Mayer' (Stuttgart 1890); id., 'Kleinere Schriften und Briefe von Robert Mayer' (Stuttgart 1893); Gross, 'Robert Mayer and Hermann von Helmholtz' (Berlin 1898); Jeutsch, E., 'Julius Robert Mayer; seine Krankheitgeschichte und die Geschichte seiner Entdeckung' (Berlin 1914).

MAYFAIR, London, England, a fashionable neighborhood in the «West End» adjoining Belgravia, east of Hyde Park, and bounded by Park lane and Bond street. See LONDON.

MAYFIELD, Ky., city, county-seat of Graves County, on the Illinois Central Railroad, about 30 miles from the Mississippi River and 25 miles from the Ohio at the mouth of the Tennessee. It was settled about 1820 and incorporated in 1850. It is in a fertile agricultural region in which the chief product is tobacco and in which the city has extensive interests. Mayfield has large tobacco warehouses and factories, clothing factories, woolen mills, fire-clay works, flour and lumber mills. It has an extensive trade in tobacco. The mayor is elected once in four years; the council acts upon the appointments of the executive. Pop. 5,916.

MAYFIELD, Pa., borough of Lackawanna County, 15 miles northeast of Scranton, on the New York, Ontario and Western and the Delaware and Hudson railroads. It has extensive interests in coal, the mining of which is the leading industry. There is also a silk mill. Pop. 3,660.

MAYFLOWER, The, the name of the vessel in which the Pilgrim Fathers, or first colonists in New England, sailed to this country in 1620. The *Mayflower* was a vessel of 180 tons. She set sail from Southampton, England, on 5 Aug. 1620, in company with her sister ship, the *Speedwell,* but the courage of the captain and the crew of the latter vessel failing, both ships put back to port. Finally on 6/17 September the *Mayflower* again spread her sails from Plymouth, having on board as passengers 41 men and their families, 102 persons in all. They succeeded in crossing the Atlantic after a stormy voyage of 63 days. They intended to go to the mouth of the Hudson River but the captain of the *Mayflower* took them to Cape Cod. They landed at Plymouth, Mass., at a point where Plymouth Rock, a huge granite boulder, stands at the water's edge. A complete and authentic list of the male passengers who landed from the *Mayflower* is as follows:

THE MAYFLOWER PASSENGERS.

Allerton, Isaac	Hopkins, Stephen
Allerton, John	Howland, John
Billington, John	Leister, Edward
Bradford, Wm.	Margeson, Edward
Brewster, Wm.	Martin, Christopher
Britterage, Richard	Mullins, William
Brown, Peter	Priest, Degony
Carver, John	Rigdale, John
Chilton, James	Rogers, Thomas
Clarke, Richard	Soule, George
Cook, Francis	Standish, Miles
Crackston, John	Tilly, Edward
Dotey, Edward	Tilly, John
Eaton, Francis	Tinker, Thomas
English, Thos.	Turner, John
Fletcher, Moses	Warren, Richard
Fuller, Edward	White, William
Fuller, Samuel	Williams, Thomas
Gardiner, Richard	Winslow, Edward
Goodman, John	Winslow, Gilbert

With these 41 male passengers and heads of families came 15 male servants, whose names were as follows:

SERVANTS ON THE MAYFLOWER.

Carter,	Langemore,	Sampson,
Coper,	Latham,	Story,
Ely,	Minter,	Thompson,
Holbeek,	Moore,	Trevore,
Hooke,	Prower,	Wilder.

The following is a copy of the covenant agreed upon by these first settlers of Massachusetts, signed and subscribed on board the *Mayflower* at Cape Cod, 10/21 Nov. 1620, two days after the ship came to anchor.

THE MAYFLOWER COMPACT.

In the name of God Amen! We whose names are underwritten, the loyal subjects of our dread sovereign Lord, King James, by the grace of God, of Great Britain, France and Ireland, King, Defender of the Faith, etc., have undertaken for the glory of God and the advancement of the Christian faith, and honor of our King and Country, a voyage to plant the first colony in the northern parts of Virginia; do by these presents, solemnly and mutually, in the presence of God and of one another covenant and combine ourselves together into a civil body politic for our better ordering and preservation, and furthermore of the ends aforesaid; and by virtue hereof to enact, constitute and frame just and equal laws, ordinances, acts, constitutions, and offices from time to time, as shall be thought most mete and convenient for the general good of the colony; unto which we promise all due submission and obedience. In witness whereof we have hereunto subscribed our names, at Cape Cod, the 11th of November, in the year of the reign of our sovereign Lord, King James of England, France and Ireland, the Eighteenth, and of Scotland the Fifty-fourth, Anno Domini 1620.

Whittier, Lowell, Holmes and other poets have immortalized the *Mayflower* in well-known poems. Consult Carpenter, E. J., 'The Mayflower Pilgrims' (New York 1918); Usher, R. G., 'The Pilgrims and Their History' (New York 1918).

MAYFLOWER. See ARBUTUS, TRAILING.

MAYFLOWER DESCENDANTS, Society of, an American patriotic society founded in New York City, 22 Dec. 1894. Its membership is confined to lineal descendants of any passengers on the *Mayflower*, the voyage of which terminated at Plymouth Rock, Mass., in November 1620. There are also numerous State societies of a similar character. There are more than 2,000 members of the society.

MAYHEM, *in law,* the maiming of one person by another, the destroying or disabling of an arm, leg, hand or foot, putting out an eye, etc. Mayhem renders the perpetrator liable to a civil action for damages, and also to a criminal prosecution.

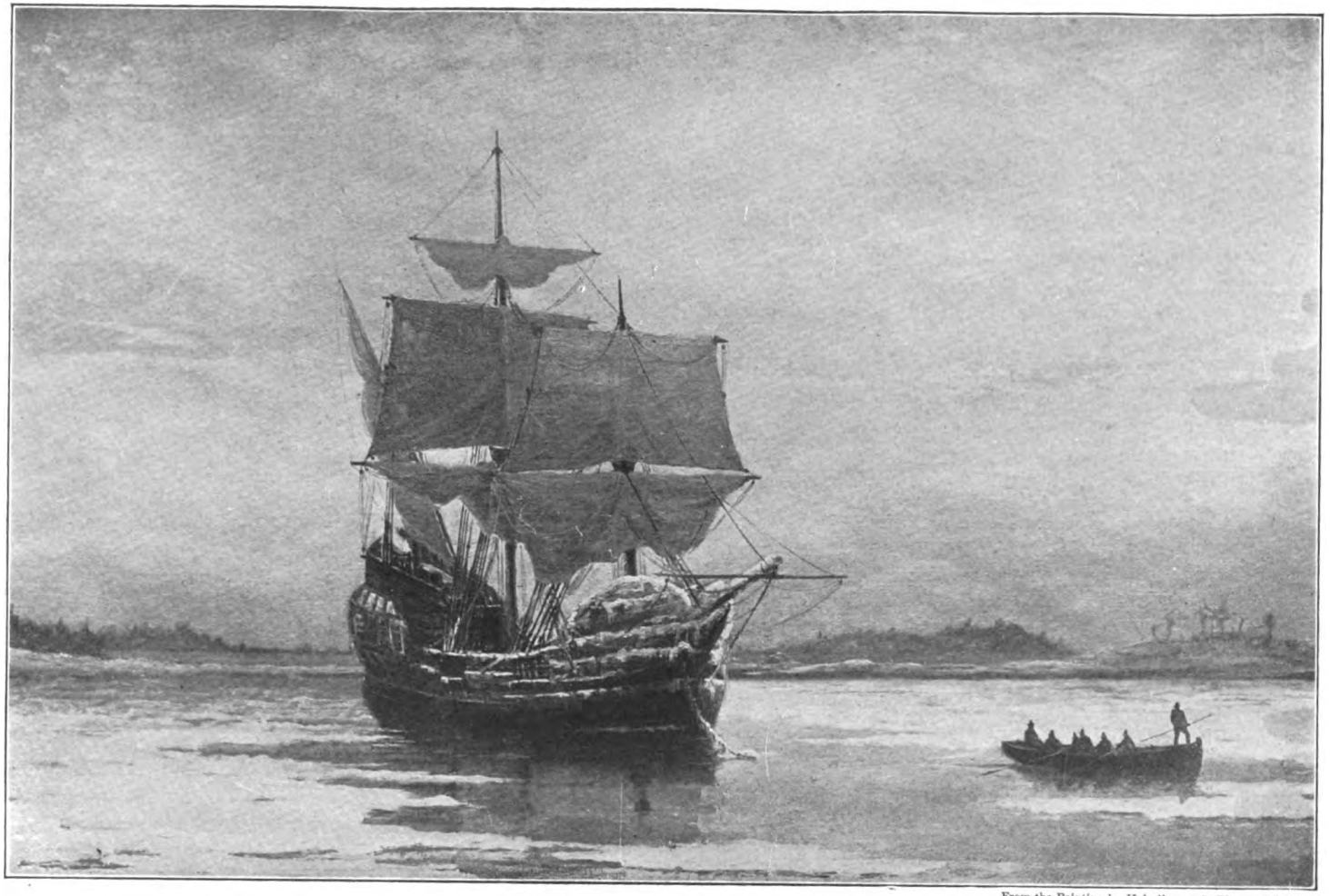
MAYHEW, mā'hū, **Experience,** American missionary: b. Martha's Vineyard, Mass., 27 Jan. 1673; d. there, 29 Nov. 1758. He took charge of a half-dozen congregations of Indians, and in 1709 executed for the Society for the Propagation of the Gospel in New England a translation of the Psalms and of the Gospel according to Saint John into the Indian tongue. His principal writing is 'Indian Converts' (1727), containing accounts of 30 Indian ministers and 80 other Indian Christians.

MAYHEW, Henry, English journalist and author: b. London, 25 Nov. 1812; d. 25 July 1887. In 1831 he started, with Gilbert A'Beckett, a periodical called *Figaro in London*; in 1841 produced, with A'Beckett, the farce of the 'Wondering Minstrel'; and not long after formed a literary partnership with his brother Augustus, the "Brothers Mayhew," as they came to be familiarly known, turning out a number of most successful works of amusing fiction. Among these may be mentioned 'The Greatest Plague of Life, or the Adventures of a Lady in Search of a Good Servant' (1847); 'The Image of His Father, or One Boy is More Trouble than a Dozen Girls' (1850); 'Living for Appearances' (1855). In 1851 appeared the first volume of his most important work, 'London Labor and the London Poor.' He was one of the founders of *Punch* (1841) and its first editor. Other works of his are 'The Wonders of Science, or Young Humphry Davy'; 'Young Benjamin Franklin'; 'The Boyhood of Martin Luther'; 'German Life and Manners, as Seen in Saxony at the Present Day'; 'The Criminal Prisons of London and Scenes of Prison Life' with Binny. His brothers Horace, Thomas and Edward also assisted Henry and Augustus in their enterprises, beside publishing independently.

MAYHEW, Jonathan, American clergyman: b. Martha's Vineyard, Mass., 8 Oct. 1720; d. Boston, 9 July 1766. He was graduated from Harvard in 1744, and from 1747 until his death was minister of the West Church in Boston. In a day of theological controversy he was prominent for his tracts. His views were so liberal as to exclude him from the Boston Association of Congregational Ministers. He opposed the measures of the British society for the propogation of the Gospel in foreign parts, and got into a dispute about it with Secker, archbishop of Canterbury. In both pulpit and press he was an earnest patriot, being of much assistance to Otis and other early leaders. By the Tories he was considered to have brought about the Stamp Act riots because of a sermon in which he pleaded for the repeal of the act. From him came the suggestion of uniting the colonies in opposition to England. Among his writings are 'Seven Sermons' (1749); 'Discourse concerning Unlimited Submission and Non-resistance to the Higher Powers' (1750), and 'Sermons' (1756). Consult the 'Memoir' by Bradford (Boston 1838); Tyler, 'History of American Literature.'

MAYHEW, Thomas, American colonial governor: b. England, 1592; d. Martha's Vineyard, Mass., 25 March 1682. Prior to his emigration to New England in 1631 he had been a merchant in Southampton. He settled first at Watertown, Mass., and in 1641 secured from the agent of Lord Stirling a grant of the larger part of the island of Martha's Vineyard and the title of governor. With his son Thomas he labored to convert the Indians of the island so successfully that during King Philip's War the island Indians protected the white settlers. He founded Edgartown in 1647, and after the death of his son and grandson continued their ministry and organized an Indian church. Consult Banks, C. E., 'The History of Martha's Vineyard' (Boston 1911).

MAYNARD, mā'nard, **Charles Johnson,** American naturalist: b. West Newton, Mass., 6 May 1845. He had a common school education, worked on a farm and devoted himself to natural history as a boy. He is well known as an ornithologist, discovered the bittern's vocal organs and in 1875 was elected vice-president of the Nuttall Ornithological Club, in connec-



From the Painting by Halsell, now in Plymouth Hall

THE MAYFLOWER IN PLYMOUTH HARBOR

tion with which he founded and edited *The Nuttall Bulletin*. As a conchologist he studied the genus *Cerion* of West Indian shells. He also made important additions to the knowledge of American butterflies. Maynard wrote 'Naturalists' Guide'; 'Butterflies of New England'; 'Birds of Eastern North America'; 'Butterflies of New England'; 'Eggs of North American Birds'; 'Contributions to Science' (3 vols.); 'Bahama Fruit Finch'; 'Manual of North American Butterflies'; 'Sparrows and Finches of New England'; 'Nature Studies' (No. 2, "Sponges"); 'Warblers of New England'; 'Monograph of the Genus Cerion'; 'Manual of Taxidermy'; 'Methods in Moss Study'; 'Birds of Eastern Massachusetts'; 'Field Dictionary to the Birds of Eastern North America'; 'Atlas to the Directory of the Birds of Eastern North America'; 'Dawn in New England'; 'Records of Walks and Talks with Nature' (8 vols.); 'Field Ornithology'; 'Plates to Field Ornithology'; 'Migration of Birds and other Animals,' and scattering articles in various magazines, etc.

MAYNARD, Edward, American inventor: b. Madison, N. J., 26 April 1813; d. Washington, D. C., 4 May 1891. He entered West Point in 1831; resigned because of ill-health in 1832; studied dentistry and practised in Washington from 1836 to 1890. He invented new dental tools, discovered in 1846 the diversity of the maxillary antra, introduced the method of filling cavities with gold foil, taught dentistry in the Baltimore College of Dental Surgery and in the National University at Washington, and practised successfully in Europe. His great fame was due to his invention of small arms and new priming methods which superseded percussion caps. He patented a breech-loading rifle in 1851; a method of converting muzzle-loaders to breech-loaders in 1860; a plan to join two barrels so that contraction and expansion in either would be independent of the other, in 1868, and in 1886 a registering device showing the number of cartridges in a magazine rifle. His rifle was adopted by the United States, and brought him decorations from the governments of Belgium, Prussia and Sweden.

MAYNARD, George Willoughby, American artist: b. Washington, D. C., 5 March 1843. He studied at the New York Academy of Design and later became a pupil of Van Terins and De Keyser at the Belgian Royal Academy, Antwerp. He had a studio in Paris in 1878, but later located in New York. He is a National Academician and librarian of the National Academy of Design, member of the Society of American Artists, the American Water Color Society and ex-president and honorary member of the Salmagundi Club. Maynard's decorative work may be seen in the Congressional Library, Washington, D. C., the Bijou Theatre, Boston, the ceiling of the Metropolitan Opera House, New York, the Essex County Courthouse, Newark, N. J., and the Appellate Court, New York. His principal canvases are 'Vespers at Antwerp'; '1776'; 'Venetian Court'; 'Ancient Mariner' (1883); 'Strange Gods' (1904); 'Old and Rare'; 'Grandfatherly Advice'; 'A Musician'; 'Rocks at Ogunquit' (1912); 'Flood Tide' (1912). He is represented in the Metropolitan Museum, New York, the Providence Museum, the Corcoran Gallery, Washington, and the Pennsylvania Academy.

MAYNARD, Horace, American politician: b. Westboro, Mass., 30 Aug. 1815; d. Knoxville, Tenn., 3 May 1882. He was graduated from Amherst College in 1838; and became instructor, and later professor, in East Tennessee College, Knoxville, Tenn. He studied law, was admitted to the bar in 1844 and built up a successful practice. In 1857 he was nominated for member of Congress by the Know-Nothing party, and elected. On the outbreak of the Civil War he declared his loyalty to the Union and took an active part in the unsuccessful attempt to keep Tennessee from seceding; on this account he suffered persecution and heavy loss of property during the war. When the Union forces occupied his State in 1864 he was made attorney-general. In 1866–75 he was again member of Congress, being representative-at-large for his State in the last two years. In 1875–80 he was appointed Minister to Turkey, and in 1880 Postmaster-General in President Hayes' Cabinet, holding the office till 4 March 1881.

MAYNARD, Mass., town of Middlesex County, 25 miles northwest of Boston, on the Boston and Maine Railroad and the Assabet River. It contains woolen mills. The town owns the water-supply system. Pop. 6,390.

MAYNOOTH, mā-nōoth', Ireland, a market-town of County Kildare, 15 miles west by north of Dublin. Its modern celebrity is derived from the well-known Roman Catholic college of Saint Patrick (q.v.). Maynooth is of historic interest as the seat of the powerful Geraldines, and has ruins of their castle, built 1176 and enlarged in 1426. Several battles with the English occurred here, including the rebellion of Silken Thomas in the reign of Henry VIII, and the war of the Confederates (1641–50). Pop. about 886.

MAYNOOTH COLLEGE. See SAINT PATRICK'S COLLEGE.

MAYO, mā'ō, **Amory Dwight,** American Unitarian clergyman and educator: b. Warwick, Franklin County, Mass., 31 Jan. 1823; d. 8 April 1907. He was graduated from Amherst, and taught in the public schools in Massachusetts 1839–44. In 1846 he became the minister of the Universalist Church at Gloucester, Mass., and later held Universalist pastorates at Cleveland, Ohio (1854–56), and at Albany, N. Y. (1856–63). He then entered the Unitarian ministry, and was pastor at Cincinnati, Ohio (1863–72), and at Springfield, Mass. (1872–80). He was long prominent as an educator, was an efficient and active member of the boards of education, in Cincinnati and Springfield, and was connected with the Meadville (Pa.) Theological School as lecturer and professor from 1868–98. After 1880 he devoted his attention chiefly to the advancement of education in the South, lecturing frequently in many different States. He was the chief editorial writer for the *New England and National Journal of Education*, and published 'The Moral Argument for Universalism'; 'Graces and Powers of the Christian Life' (1852); 'Biography and Collected Writings of Mrs. S. C. E. Mayo'; 'Symbols of the Capitol, of Civilization in New York' (1859); 'Talks with Teachers' (1885); 'Southern Women in the Recent Educational Move-

ment in the South' (1892), and 'History of the American Common School.'

MAYO, Charles Horace, American surgeon: b. Rochester, Minn., 19 July 1865. He was educated at the Rochester High School, Northwestern University, and in 1888 was graduated in medicine at the Chicago Medical College. In the same year he entered on the practice of medicine at Rochester, where he has since resided. He has received the following honorary degrees: A.M., Northwestern University, 1902; LL.D., University of Maryland, 1909; F.A.C.S., American College of Surgeons, 1913; LL.D., Kenyon College, 1916; D.Sc., Princeton University, 1917. Dr. Mayo is surgeon to the Mayo Clinic of Saint Mary's Hospital, Rochester, Minn.; to the Mayo Foundation, University of Minnesota, where he has been professor of surgery since 1915. In 1913 he was commissioned first lieutenant in the Medical Reserve Corps, United States Army; was appointed major in 1917, and colonel in the same corps in 1918. In the same year he was made associate chief consultant of the United States Army Medical Department for Surgical Services. He is also consulting surgeon of the Chicago and Northwestern Railway and of the Chicago Great Western Railway. Dr. Mayo is a member of the American Medical Association, of which he was president in 1916–17 and chairman of the section on surgery in 1910; of the American Surgical Association; of the Association of Military Surgeons of the United States; of the Clinical Congress of the American College of Surgeons (president in 1914–15); of the Minnesota State Medical Society, of which he was president in 1905; of the Society of Clinical Surgery; of the Southern Surgical and Gynecological Society; of the Western Surgical and Gynecological Society, of which he was president in 1904–05; of the Council of National Defense Medical Board; of the National Medical Museum; of the Minnesota Pathological Society; of the American Association of Railway Surgeons; of the American Association for the Advancement of Science; etc.; etc. In 1908–09 he was president of the section on surgery of the International Congress on Tuberculosis. In 1915, with his brother, W. J. Mayo (q.v.), he donated $1,500,000 to establish the Mayo Foundation for Medical Education and Research at Rochester, in affiliation with the University of Minnesota.

MAYO, Frank, American actor: b. Boston, 19 April 1839; d. 8 June 1896. His first appearance on the stage was at the American Theatre in San Francisco, and he was for several years the leading actor on the Pacific coast. In August 1865 he appeared in Boston as Badger in 'The Streets of New York' with great success, and though he played Shakespearian and other rôles acceptably, notably Othello, Hamlet and Ferdinand, became best known in his character of Davy Crockett, first played by him in Rochester, N. Y., in 1872, and thereafter almost exclusively by him till 1884. In later years he played in his own drama of 'Nordeck' and in a stage version of 'Pudd'nhead Wilson.'

MAYO, Henry Thomas, American naval officer: b. Burlington, Vt., 8 Dec. 1856. In 1876 he was graduated at the United States Naval Academy; was advanced through various grades and promoted rear-admiral 15 June 1913. In 1915 he was made vice-admiral and in 1917 was promoted admiral. He served on various vessels of the United States navy, also on both naval and coast survey; was commandant of the Mare Island navy yard in 1911–13; served as aide for *personnel* at the Navy Department, Washington, in 1913, and on 18 December of that year was made commander of the fourth division of the Atlantic fleet. In 1915 he commanded the battleship squadrons of the Atlantic fleet and two years later became commander-in-chief of that fleet and hoisted his flag on the *Pennsylvania*. Admiral Mayo demanded an apology from the Mexican commander at Tampico and the firing of a national salute of 21 guns to the United States flag, to make amends for arrest of paymaster and crew of the dispatch boat *Dolphin* at a wharf while loading gasoline into whaleboat on 9 April 1914. The admiral's action was commended and approved by the government at Washington, and the occupation of Vera Cruz later in the same month was one result of the flag incident. See MEXICO, DIPLOMATIC RELATIONS WITH.

MAYO, William James, American surgeon: b. Le Sueur, Minn., 29 June 1861. He is a brother of Charles Horace Mayo (q.v.), was educated at Rochester High School and Niles Academy and received his professional training at the University of Michigan, where he was graduated in 1883. Thereafter he practised in Rochester, Minn., as surgeon to Saint Mary's Hospital. He became first lieutenant of the Medical Reserve Corps of the United States army in 1913. With his brother he established the Mayo Foundation for Medical Education and Research at Rochester in 1915. He is regent to the University of Minnesota, was president of the State Medical Society in 1895–96, of the American Medical Association in 1905–06, of the American Surgical Association in 1913–14, and of the Society of Clinical Surgery, 1911–12. He is also a member of the American College of Surgeons, of the Clinical Congress of Surgeons of North America, of the Academie de Medicine de Paris (corresponding secretary), of the Société de Chirurgie de Paris, of the Royal College of England and Scotland. He has received honors from all the principal universities as follows: M.D., University of Michigan, 1883; A.M., University of Michigan, 1889; LL.D., University of Toronto (1906), University of Maryland (1907), University of Pennsylvania (1912); D.Sc., University of Michigan (1908) and Columbia University (1910). He is a Fellow of the Royal College of Surgeons of England since 1913, of Scotland since 1905 and of the American College of Surgeons since 1913. He is widely known for his numerous successful operations in cases of gallstones, cancer and diseases of the intestinal tract.

MAYO, William Starbuck, American novelist: b. Ogdensburg, N. Y., 20 April 1812; d. New York, 22 Nov. 1895. His parents had removed to Ogdensburg in the year of his birth. He studied in his native place and in Potsdam Academy and in 1833 was graduated at the College of Physicians and Surgeons, New York. After practising his profession for several years in Ogdensburg he was forced to abandon it owing to ill health. He visited Spain, made a tour in the Barbary States and

then took up his residence in New York City, where he gave his entire attention to literature. He is the author of 'Flood and Field, or Tales of Battles on Sea and Land' (1844); 'Kaloolah, or Journeys to the Djebel Kumri,' purporting to be the autobiography of Jonathan Romer and describing his marvelous adventures in Africa (1849); 'The Berber, or the Mountaineer of the Atlas,' similar to the preceding (1850); 'Romance Dust from the Historic Places,' a collection of short tales, founded on historical incidents (1851); 'Never Again,' a novel (1872).

MAYO, mī'ō, a tribe of Mexican Indians of the Piman family, located on the banks of the Mayo River in southern Sonora. Their allies and northern neighbors are the Yaquis and their habits and language, the latter known as Cahita, are almost identical. They are a peaceful, agricultural people and are thoroughly Mexicanized. They number perhaps 6,000.

MAYO-SMITH, mā'ō-smith', **Richmond,** American political economist: b. Troy, Ohio, 9 Feb. 1854; d. New York City, 11 Nov. 1901. He was graduated from Amherst College in 1875 and studied in Germany for two years at the universities of Berlin and Heidelberg. From 1877 he was connected with Columbia University, first as assistant in history and political science, then as adjunct professor (1878–83) and professor of political economy and social science (1883–1901). He was also one of the faculty of the graduate School of Political Science, established in 1880, and his chief work as teacher was done in this school. His specialty was statistics, on which he was a recognized authority. He was an honorary Fellow of the Royal Statistical Society of Great Britain, a member of the International Statistical Institution and of the American Statistical Association, being vice-president of the latter; he was also a member of the National Academy of Science and of the American Economic Association, of which he was one of the founders. He was editor of the *Political Science Quarterly* from 1886, and published 'Emigration and Immigration' (1890); 'Statistics and Sociology' (1895); and 'Statistics and Economics' (1899).

MAYON, mā-yōn', a volcano of the Philippines situated in the northern part of the province of Albay, Luzon, height, 8,274 feet. It rises from a broad plain about six miles from Albay Gulf and forms a perfect cone; its summit is surrounded by vapor, which at night has a fiery glow. Its sides, almost at the top, are covered with grass or moss, and the ascent, though it has been made, is difficult. Near the summit there are fissures which emit sulphurous gases and steam, and there were several eruptions during the 19th century, the town of Cagsaua at the foot of the mountain being entirely destroyed in 1814. Great quantities of lava and ashes were belched forth in the last eruption (1897).

MAYONNAISE, mā-ŏn-āz', a thick cold dressing for salads, cold meat, poultry, fish, vegetables, etc., made of the yolks of eggs, salad oil and vinegar, with a little salt and pepper; it is sometimes colored red with powdered lobster shell or green with spinach or parsley.

MAYOR. See CITIES, AMERICAN, GOVERNMENT OF; CITY MANAGER PLAN OF GOVERNMENT; EXECUTIVE.

MAYOR OF ZALAMEA, The ('El Alcalde de Zalamea'). Two Spanish plays bear this title, the first by Lope de Vega (1562–1635), the second, an adaptation, by Calderón de la Barca (1600–81). The superiority of the adaptation over the original is admitted by all critics. A comparison of the two works is somewhat unfair to Lope de Vega, because his play is one of his least worthy productions. He reveals, indeed, his characteristic spontaneity, but fails to seize resolutely upon the dramatic possibilities of his story, preferring for some reason to narrate events in their chronological sequence. Calderón studies the dramatic situations more carefully and by discarding irrelevancies, reducing the number of personages and sharpening the features of those retained, produces a masterpiece. To his predecessor he owes his plot, the dramatic conflict, the principal personages and a few lines which he transfers to his play unaltered. The most striking difference between the two pieces is the character of Isabella, daughter of the mayor (or magistrate). In Lope's play there are two daughters, both flirtatious to the last degree. So little control has the father over them, that when he is appointed magistrate, he asks pathetically, "How can a father who fails to rule at home, govern a town?" The fate of the daughters at the hands of dissolute soldiers does not surprise the spectator, and the penalty of death imposed upon the seducers hardly seems justified. Calderón corrects this defect, and in Isabella, who replaces Leonora and Agnes, he presents a modest young woman, the unhappy victim of a crime which she strives in vain to prevent. Her soliloquy after she has been wronged is pathetic and poignant, and is one of the best passages in the play (Act II, scene i). Among other excellent scenes may be noted the magistrate's farewell to his son, in which shrewd advice and good feeling are happily blended (Act II, scene xxi), and the prolonged struggle between the magistrate and the gouty, blustering, irascible, old soldier, Lope de Figueroa (Act III, scene xv). King Philip II, who appears suddenly at the close of the play, sets his seal of approval upon the action of the father-magistrate in avenging the wrong done to his daughter and thus vindicates the triumph of justice and local autonomy (a precious privilege to Spaniards) over the lawlessness of undisciplined soldiery. The events narrated by the two dramatists are so circumstantial that it is assumed that they are based on a real incident in the march of Philip II into Portugal (1580), when the Tercio de Flandes, a famous regiment commanded by Lope de Figueroa, passed through Zalamea, a small town in Estremadura. Krenkel published both plays with valuable notes in 'Klassische Bühnendichtungen der Spanier' (Vol. III, Leipzig 1887). Consult also Menéndez y Pelayo's edition in 'Obras de Lope de Vega' (Vol. XII, 1902), and 'Select Plays of Calderón' (ed. Maccoll, London and New York 1888).

MILTON A. BUCHANAN.

MAYORUNA, South American Indian tribe of Panoan stock. Their country lies south of the Marañon and between the Ucoyali and

Javari rivers, in eastern Peru. They are nomadic, are tall and well formed, go entirely naked and live by hunting. The hair is cut away from the forehead but is allowed to fall down the back. Some have fair skin and beard attributed with some degree of probability to an admixture of white blood through Spanish captives. The tribe is savage and wages constant war with the whites and with other Indian tribes. Spears, clubs and blowpipes are their war weapons. The blowpipe, from which a poisoned dart is thrown a considerable distance, is their most formidable and dangerous weapons.

MAYOTTA, mā-yŏt'tä, or **MAYOTTE,** mä-yŏt'. See COMORO ISLANDS.

MAYOW, mā'ō, or **MAYO, John,** English physiologist and chemist, the first to attack the theory of phlogiston: b. London, May 1643; d. there, October 1679. He was of a Cornish family; entered Wadham College, Oxford, in 1658; became a scholar there in 1659; and was elected a Fellow of All Souls in 1660. He was graduated in 1665; studied medicine; practised in Bath; and in 1678 was elected to the Royal Society. His Latin tract on the respiration appeared in 1668; it urged that the heart was a mere muscle, that breathing is simply to give the nitroaerian constituent (oxygen) to the blood and that this constituent is necessary to life. In 1674 he published 'Tractatus Quinque,' summarizing and completing his theory; in this work he showed that «fire-air,» «nitre air» or «aerial spirit,» as he styled oxygen, is contained in all acids and is necessary to combustion and respiration, which are therefore analogous. The 'Tractatus Quinque' was republished in 1681 as 'Opera Omnia Medica Physica.' In 1684 a Dutch translation appeared; in 1799 a German, and French and English translations in 1840 and 1907, respectively.

MAYOYAOS, mā-yō-yä'ō, a native tribe of the island of Luzon, Philippines, living in the southwestern part of the province of Isabela and in the northwestern angle of the province of Nueva Vizcaya. They are a head-hunting tribe of Malay race; and of the Ifugao linguistic stock.

MAYSVILLE, māz'vĭl, Ky., city and county-seat of Mason County, on the Ohio River and on the Louisville and Nashville and the Chesapeake and Ohio railroads, about 63 miles southeast of Cincinnati. The first settlement was made about 1782, and in 1787 it was incorporated by the legislature of Virginia. In 1833 it was granted a city charter and in 1848 became the county-seat. It is in a rich agricultural region and its facilities for transportation give it considerable commercial importance. Its chief manufacturing establishments are flour and lumber mills, foundries, distilleries, cotton mills, plow and pulley works, boot and shoe factories, tobacco, furniture and pressed brick. Some of the prominent buildings are the Masonic Temple, the Odd Fellows' Temple, the post office, Wilson Memorial Hospital, the County Historical Association Building and the Maysville and Mason County Public Library. The library organization was established in 1878. The government of the city is vested in a mayor, who holds office four years, and a council. Pop. 6,141.

MAYWOOD, Ill., village in Cook County, 10 miles west of Chicago, situated on the Des Plaines River and on the Chicago Great Western, the Chicago and Northwestern and other railroads. It is the seat of the Chicago Theological Seminary, the German Lutheran Theological Seminary, the Logan Home, the Baptist Old People's Home, the Kittie Smith Home for Crippled Children and Library Hall. Maywood's industrial establishments manufacture tin plate, cans, etc., and lithograph products. The village owns the water-supply system. Pop. 9,780.

MAZARIN, Jules, or **GIULIO MAZARINI,** French cardinal and minister of Louis XIII, Anne of Austria and Louis XIV: b. Piscina, in the Abruzzi, Italy, 14 July 1602; d. Vincennes, 9 March 1661. He came of a Sicilian family, his father being intendant of Philip Colonna. The first part of his life was spent in reaching out for power and the second part in maintaining that power. Young Mazarin first attempted fortune in a military career. After brilliant studies under the direction of the Jesuits at Rome and afterward at the universities of Alcala and Madrid, he entered the papal military service as captain of infantry in 1625. His talents, however, lay in diplomacy to which he soon turned and wherein he distinguished himself by his ability. He was rewarded for his services by being made vice-legate to Avignon, in 1634, and as nuncio at Paris, in 1634–36. At Paris he gained the favor of Richelieu, who persuaded him to enter the service of France, which he did in 1640. He became a naturalized citizen of France; was made a cardinal (although not a priest) in recognition of his diplomatic services in Savoy; and in 1642 was designated by Richelieu as his successor. On the death of Louis XIII the queen, Anne of Austria, became regent for her young son, Louis XIV, and it was thought that Mazarin would be dismissed, but instead he gained over the queen-regent, to whom he became bound by mutual ties of affection, and perhaps by a secret marriage. By her he was confirmed in the office of Prime Minister, in May 1643, and this office he continued to occupy, with the exception of two brief periods of exile, until his death. His activities were first directed toward the *Cabale des Importants,* which he soon suppressed, and to the prosecution of the Thirty Years' War. The war was carried on with success due mostly to the soldierly qualities and ability of Turenne and Condé. The victories of Rocroi, Fribourg, Nordlingen and Lens and the revolt at Naples forced the German emperor to terms and obliged him to cede Alsace to France by the Treaty of Westphalia, in 1648. While prosecuting these enterprises abroad, Mazarin had unfortunately neglected home affairs and financial embarrassments resulted in a general revolt and civil war known to history as the Fronde. The Parliament of Paris denounced the increasing taxation, while the nobility dreaded the supremacy of Mazarin. As the immediate result of the conflict Mazarin quitted Paris with the court and took up his residence at Saint-Germain, in January 1649. In April he concluded an amnesty with the Parliament, but further opposition developed from the younger members of the aristocracy (*petits-maîtres*) and in

particular from Condé, who had hitherto remained faithful to the royal authority. With the support of the parliamentarians, Mazarin was enabled to put down the *Fronde des princes*, imprisoned Condé at Vincennes and crushed the revolt of the latter's friends at Rethel and Guyenne, in 1650. Mazarin's ingratitude to his late allies, the parliamentarians, caused all his adversaries to unite against him and in February 1851 he was obliged to go into exile near Cologne. His activity, however, was nowise at an end. He continued to direct the policy of Anne of Austria from his exile and, in September, rejoined the court at Poitiers, and soon afterward was about to enter Paris with it when he saw that his presence was an obstacle to the young king's entry to the capital. He again went into exile, in October 1652, but returned to Paris on 13 Feb. 1653, and through means of intrigue formed a powerful royal party in the state, gained General Turenne to his cause and returned to his position at court.

Untroubled now with troubles from within, Mazarin set about winding up the war with Spain. The outcome of this conflict remained in doubt until 1655, when French victory became assured through the alliance with Cromwell and the help of English soldiers. The Spaniards, beaten at the Dunes, at Dunkirk, threatened in the Netherlands and menaced at home by the capture of Barcelona, were obliged to sue for peace. By the Treaty of the Pyrénées (1658) the Spaniards lost to France, Roussillon, Artois and parts of the duchy of Luxembourg and of Hainaut. Not satisfied with this splendid result, Mazarin formed, in 1658, the League of the Rhine against Austria and diverted the succession to the throne of Spain by bringing about the marriage of Louis XIV with the Infanta Maria Theresa. With the completion of these projects his career ended. Mazarin was very avaricious, and through every kind of financial dealing amassed the huge fortune of over 50,000,000 livres. To the Royal Library he bequeathed his magnificent collection of books. He founded the Collège de Quatre-Nations, later known by his name as the Collège Mazarin. He has been blamed for the favors shown his family and the project, once entertained by him, of marrying his niece, Maria Mancini, to Louis XIV. These, however, are but the smaller side of a great character. They cannot make one forget the great political genius who extended the territory of France from the Pyrénées to the Rhine and which extricated her from a dangerous internal crisis. Consult Chéruel, 'Lettres du cardinal Mazarin pendant son ministère' (in 'Collection de documents inédits sur l'histoire de France,' Paris 1872–94); id., 'Histoire de France pendant la minorité de Louis XIV' (1879–80); id., 'Histoire de France sous le ministère de Mazarin' (1883); Chantelauze, 'Portraits historiques' (1886); Cousin, V., 'La jeunesse de Mazarin' (1865); Hassell, A., 'Mazarin' (1903); Perkins, J. B., 'France under Mazarin' (New York 1915).

MAZARRÓN, Spain, town, in the province of Murcia, 18 miles west of Cartagena and about three miles from the Mediterranean coast, with which it is connected by rail. It has flouring mills, soap works and metallurgic factories, and there are copper, iron and lead mines in the nearby mountains. A customhouse, barracks, lighthouse and lead works are situated on the coast. The town has a large trade in coal, lead and other ores. Pop. 22,660.

MAZATLAN, mä-sät-län', Mexico, a town and seaport of Sinaloa, about 183 miles southeast of the city of Sinaloa, at the entrance to the Gulf of California, on the Mexican Southern Pacific Railroad. It is built on a hilly crest and has a pleasing appearance. It has a municipal gas system and a street railway. Mazatlan is the chief Pacific port of Mexico and the outlet for the products of the mining district of Saint Sebastian; it has a considerable import and export trade. Silver, copper, lead, pearls and hides are exported. In 1914 the town was besieged by the Constitutionalists and taken after many months. A consul of the United States is located here. In normal times the exports amount annually to about $4,250,000 and the imports to $2,500,000.

MAZDAK, mäz'däk, Persian religious leader: b. Persepolis, about 470 A.D.; d. Nahrvan, between 530 and 540. He was a chief priest at Nishapur, and in 500 proclaimed himself a prophet. He preached the equality of man, the abolition of property rights and free love, abstinence from animal foods and the simple life generally. He converted King Kobad to his views, which forthwith became law, but a rising of the nobles ousted Kobad for three years, and on his return he abjured Mazdak and his doctrine. Khosru Nashirvan put him to death. Consult Browne, E. G., 'Literary History of Persia' (London 1909).

MAZE, Hippolyte, ē-pō-lēt mäz, French historian: b. Arras, 5 Nov. 1839; d. Paris, 25 Oct. 1891. He studied at the Ecole Normale Supérieure; taught there and at the Lycée Fontanes; was elected prefect of Landes in 1870, deputy in 1879 and 1881 and senator in 1886. He wrote 'The Republic of the United States: Its Foundation' (1869); 'The End of the Revolution' (1872); 'Hoche in Vendée' (1882); 'The Struggle against Want' (1883); 'General Marceau' (1889), and 'The Generals of the Republic' (1889).

MAZEPPA, mă-zĕp'ä, Ivan Stepanovitch, or John, hetman of the Cossacks: b. Podolia, about 1645; d. Bender, Bessarabia, 1710. He was page to John Casimir, king of Poland, who was a patron of the arts and of literature, and he had therefore an opportunity of acquiring various useful accomplishments. A Polish nobleman having surprised Mazeppa with his wife bound him naked upon his own horse and committed him to his fate. The horse carried him to his own residence. Shame made him flee to the Ukraine and join the Cossacks, whose warlike roving life suited his disposition. He made himself conspicuous by his dexterity, bodily strength and courage. His knowledge and sagacity procured him the post of secretary to the hetman Samilovitch, and in 1689 he overthrew Samilovitch and himself became hetman. He gained the confidence of Peter the Great, who loaded him with honors and he was finally made Prince of the Ukraine. In 1706 he opened negotiations with Charles XII (q.v.) of Sweden for the purpose of freeing himself from Russian dominion, but his treachery was finally revealed to Peter, and he was obliged openly to declare for Charles. After the defeat of Pultowa in 1709 Mazeppa

fled to Bender. Peter tried to have the sultan extradite him, but failed despite an offer of 300,000 ducats for the favor. Lord Byron has made Mazeppa the hero of a poem (1818) and Liszt of a symphony.

MAZURKA, a lively Polish national dance, popular also in the United States. The movements are of a grotesque character. The term is also applied to the music which accompanies the dance, sometimes in three-eighths time, but for the most part in three-fourths. The mazurka is danced by four or eight couples. Augustus III brought the mazurka to Germany, whence it was learned by the French and finally about the middle of the 19th century it acquired considerable popularity in England. The music of the dance has taken its modern form from Chopin.

MAZZINI, Giuseppe, Italian patriot: b. Genoa, 22 June 1805; d. Pisa, 10 March 1872. He studied law at the University of Genoa and practised his profession for a time, but the strong Liberal opinions he had imbibed as a child and his conviction that the oppressed condition of his country under Austrian rule called for men of action and public spirit, and that a noble course lay open before anyone who would give himself up, heart and soul, to the work of reforming her, led him to devote himself to a political career. In his ardent aspirations for the national unity of Italy, it seemed to him that her deliverance from foreign tyranny was to be achieved only by a return to the republican glories of ancient times. His patriotic enthusiasm in this direction was fostered by his early studies, which developed in him a passionate idea of the glories of a republic, and by the success which he had achieved in literature while still little more than a youth. In 1827 appeared his maiden essay, 'Dell' Amor Patrio di Dante,' which was published in a Liberal journal, the *Subalpino.* This led him to contribute under the mask of literary critiques other historical, philosophical and critical papers to the *Antologia* of Florence and the *Indicatore Genovese.* But the authorities, perceiving that the periodical literature of Italy was becoming far too strongly tainted with advanced Liberal opinions, suppressed these journals, and hoped, no doubt, thereby to have silenced their writers also. About 1830 Mazzini became an active member of the Carbonari, and this affiliation was the introductory step to his subsequent political life; he was active, able, bold and impetuous, and he soon rose into a position which gave him great influence in the councils of that secret society. While on a mission for the society he was betrayed by a Piedmontese spy, arrested and detained for six months as a prisoner in the fortress of Savona. On his release he went to Marseilles, France, to escape the police surveillance imposed on him in Italy. Here he organized the society of La Giovine Italia (Young Italy), and established under that same title a journal to advocate his views; the purpose of the society was to liberate Italy and establish a national government, Mazzini desiring a republic. It was about this time, too, that he addressed to Charles Albert of Sardinia the celebrated letter which drew down on him a sentence of perpetual banishment from his native country. He took active part in the organization of an insurrection of which Genoa was to be the centre, but the plot was discovered and failed. For his share in it Mazzini was sentenced to death in the Sardinian courts. He then went to Switzerland, where he organized another conspiracy for the invasion of Savoy (1834), which also failed. In 1837 he quitted Switzerland and took up his abode in London, where he kept in correspondence with the revolutionary leaders on the Continent, was recognized as the head of the Young Italy party, and instigated several insurrections, which were unsuccessful. After the insurrection in Milan in 1848 he again went to Italy, was chosen a member of the Tuscan provisional government in February 1849, and in the following month, when Rome was proclaimed a republic, he was chosen first of the triumvirs. He was the mainspring of the defense of Rome against the French, and on the surrender of that city in June Mazzini escaped to Lausanne, Switzerland. At this time he addressed to M. de Tocqueville and other French statesmen some most bitter and reproachful letters on the high-handed policy pursued by France. Finding his continental residence too hot for him he returned to London, not, however, with any idea of abandoning his long-cherished hopes for Italian unity. Later he had a hand in the unsuccessful uprisings at Mantua (1852), in Milan (1853) and in Piedmont (1857), being in Italy for a short time in 1857. He assisted also in organizing the expeditions led by Garibaldi in 1860, 1862 and 1867. An ardent Republican, he refused to take his seat in the Italian Parliament under the monarchy, though repeatedly elected from Messina, as a protest against the uncanceled sentence of death against him. In 1866 this sentence was formally rescinded; in 1868 he suffered from a serious illness, the effects of which left him in impaired health. In 1870 he was arrested at Gaeta under charge of conspiracy with Garibaldi and imprisoned for two months, being released after the occupation of Rome by the Italians. He was accorded a public funeral by the Italian government.

Mazzini was a copious writer. A perfect master not only of Italian, but of French and of English literature; he was an able commentator of Dante, the author of works on philosophy and a constant contributor to some of the most delightful periodical literature in Paris and in London. He would turn from the warfare of politics to write in his *Apostolato Popolari* for the benefit of Italian workmen sermons 'On the Duties of Man.' He analyzed in masterly fashion the faults and shortcomings of the economic and socialist schools. Though his actions were sometimes politically indiscreet, he was a man of attractive character and strong personal magnetism, distinguished throughout his career for disinterested patriotism and the highest moral standards of conduct. He was interested in the labor movement, organized a workingmen's association in London in 1840 and was for a time connected with the International Workingmen's Association (q.v.), but withdrew from that society when it declared for Socialism. During his later life especially his efforts were directed toward separating republicanism from both Socialism and atheism. No man won so many admirers as Mazzini and yet secured so

few friends. There was hardly a human being whom long familiarity had not estranged from Mazzini. With manners consummately affable and courteous he combined an overweening conceit and a narrowness and bigotry of view which hardly tolerated independent minds. He was a lonely genius, all apart from the common ways of other mortals, spurning the suggestions of the plainest common sense, professing to do all for his fellow-beings, yet nothing with them or by their aid. He gave up the idea of ever being a prophet in his own country in his own age; his only trust was in a coming generation, where the germ of his idea could alone attain full development. The best edition of his works is 'Scritti Editi ed Inediti' (18 vols., Milan 1861–91); a partial collection is published under the title 'Life and Writings of Joseph Mazzini' (1891). His letters have been published in English (6 vols., London 1890–91). Consult 'Memoir of Joseph Mazzini' (1877), containing his two essays 'Thoughts on Democracy in Europe,' and 'On the Duties of Man'; Linton, W. J., 'Recollections of Mazzini' (1892); Marriott, 'Makers of Modern Italy' (1889); MacCunn, J., 'Six Radical Thinkers' (London 1907); Holland, R. S., 'Builders of United Italy' (New York 1908); 'Cambridge Modern History' (Vol. XI, ib. 1909); King, Bolton, 'Life of Mazzini' (new ed., ib. 1912); King, H. E. B., 'Letters and Recollections of Mazzini' (London 1912); Thayer, 'The Dawn of Italian Independence' (1893); Martinengo-Cesaresco, 'Italian Characters.'

MAZZOLA, mat-so'la, or **MAZZUOLI,** mat-soo-ō'lā, **Francesco,** Italian painter, known from his birthplace as IL PARMIGIANO: b. Parma, 11 Jan. 1503; d. Casalmaggiore, 24 Aug. 1540. His father and two uncles were painters, and to them and to Correggio, who was in Parma in 1521, he owed his earlier training. Correggio's manner he caught so well that his 'Cupid Fashioning a Bow' was long and generally attributed to Correggio. When 20 he went to Rome and there imitated Raphael and Michelangelo. In 1527, upon the capture of Rome by Charles V, his losses were great and he had to escape from the city. He returned to Parma, lost his health, was imprisoned by the city authorities for failure to complete a commission which had been paid for in advance, and upon his release fled to Casalmaggiore, failing to live up to his promise to repay. His paintings are to be found in most of the galleries of Europe; mention should be made of the 'Madonna with St. Margaret,' in the Bologna Gallery; 'Madonna del Collo Lungo,' Pitti Palace, Florence; 'Annunciation,' Ambrosian Library, Milan; various portraits in the Naples Museum; several sacred subjects, notably 'Madonne' in the Dresden Gallery and in the Louvre; and the great frescoes in the church of Saint John, Parma. More important, though less well known, are Mazzola's etchings, since he introduced etching into Italy. His drawing is correct, and his work bold, fiery and graceful.

MAZZONI, Guido, gwē'dō mat-so'ne, Italian scholar and poet: b. Florence, 12 June 1859. He was educated at Florence, Leghorn and Bologna, in 1881 became instructor in Italian literature in secondary schools and in 1887 professor of Italian literature at Padua. After 1894 he was professor of the Italian language and literature at the Institute of Florence. His poetic work has been to some extent influenced by his familiarity with English literature and largely by his countryman Carducci. Besides contributions to reviews, he wrote 'Epigrammi di Meleagro da Cadora' (1880); 'In Biblioteca' (1882); 'Esperimenti metrici' (1882); 'Un Ritratto di Gesū' (1887); 'Rassegne litterarie' (1887); 'Fra Libri et Carte' (1887), and other works, including a scholarly history of Italian literature in the last century.

MEAD, Edwin Doak, American author and lecturer: b. Chesterfield, N. H., 29 Sept. 1849. His early life was spent on his father's farm, and in 1866 he entered the publishing house of Ticknor and Fields, Boston. He studied in English and German universities 1875–79, and has since engaged in lecturing and writing. In 1889 he was associate editor of the *New England Magazine* with Edward Everett Hale, the chief editor, 1890–1901. He is connected with numerous historical and social clubs. For 25 years he was director of The Old South Historical Works; edited 200 Old South leaflets widely used in schools and colleges, and annually arranged courses of lectures. For several years he was president of the Massachusetts Good Citizenship Association and Free Religious Association, and for 10 years president of the Twentieth Century Club. He has labored earnestly in the cause of international peace. He is a trustee of the Church Peace Union, endowed by Mr. Carnegie, and was delegate to international peace congresses at Glasgow, Rouen, Lucerne, Munich and London. He has published 'The Philosophy of Carlyle' (1881); 'Martin Luther: A Study of the Reformation' (1884); 'A More Beautiful Public Life'; 'Organize the World'; 'The Principles of the Founders'; 'The Influence of Emerson.'

MEAD, Larkin Goldsmith, American sculptor: b. Chesterfield, N. H., 3 Jan. 1835; d. 15 Oct. 1910. He was educated in the public schools and studied art in Italy, where in Venice he was a member of the United States consulate. His first work was an ideal figure, 'The Recording Angel,' executed in 1855. He served for a time in the Civil War as illustrator for *Harper's Weekly,* and after the war his work as a sculptor gave him national prominence. The statue of Lincoln on the monument at Springfield, Ill., is his work, as are the bronze statues of Ethan Allen at the Capitol at Washington and in Montpelier, Vt. The latter city has also his heroic figure 'Vermont' on the State Capitol. He also executed the soldiers' monument at Saint Johnsbury, Vt.; the Stanford family group for Stanford University; 'The Mississippi River,' Minneapolis; portraits of W. D Howells, John Hay and Henry James. His work includes many ideal pieces: 'The Returned Soldier'; 'The Return of Proserpine from the Realm of Pluto' (exhibited at the World's Columbian Exposition), etc.

MEAD, William Rutherford, American architect: b. Brattleboro, Vt., 20 Aug. 1846. He was graduated from Amherst College in 1867, studied architecture in New York under Rus-

sell Sturgis and in Europe, and upon his return to the United States became a member of the prominent New York firm of McKim, Mead and White, which has had charge of many of the most important public and private buildings in the country. In 1902 he was made a Fellow of the American Institute of Architects, and is a member of the American Academy of Arts and Letters and president of the American Academy, Rome. In 1910 he was chosen member of the National Academy of Design and was awarded a gold medal of honor by the National Institute of Arts and Letters. He is a brother of L. G. Mead (q.v.).

MEAD, or **METH,** a vinous liquor, used in northern Europe and made of honey and water by means of digestion and fermentation. It also receives an addition of fruit, spices and simples to give it a richer flavor. When new, mead has always a strong taste of honey, but this diminishes as it becomes older. Mead is mixed with the must of apples or with wine, beer and even vinegar, and then takes the name of wine-mead, beer-mead, etc. It is one of the oldest of beverages, being known all over Europe within historic times.

MEADE, George Gordon, American soldier: b. Cadiz, Spain, 31 Dec. 1815; d. Philadelphia, 6 Nov. 1872. In 1835 he was graduated from the United States Military Academy and assigned to the 3d Artillery, in 1835–36 served in the Seminole War in Florida, on 26 Oct. 1836 resigned from the army, and in 1836–37 was assistant engineer in the construction of the Alabama, Florida and Georgia Railway. He was later employed in various works of engineering, including surveys of the mouths of the Mississippi and of the northeast boundary between the United States and British North America. On 19 May 1842 re-entered the army as second lieutenant of topographical engineers. He joined Scott's staff at Corpus Christi, Tex., 14 Sept. 1845, and during the Mexican War participated in the battles of Palo Alto, Monterey, Resaca de la Palma and the siege of Vera Cruz. After the war he was occupied in lighthouse construction and in the geodetic survey of the Great Lakes (1857–61). He became captain in the corps of engineers in 1856. On 31 Aug. 1861 he was commissioner brigadier-general of volunteers and assigned to the command of the 2d brigade of the Pennsylvania reserve corps of the Army of the Potomac, stationed on the right of the lines before Washington. He served in the Virginia peninsula campaign and took part in the actions at Mechanicsville (26 June), Gaines' Mill (27 June) and Frayser's Farm (30 June). On 18 June he was promoted major of engineers. At Manassas (second Bull Run) he commanded the 1st brigade of Reynold's division, and later he took a distinguished part at South Mountain (14 September) and Antietam (17 September). In the latter battle, when Hooker was wounded, he was placed in command of the First Corps. For his services he was promoted major-general of volunteers 29 Nov. 1862; and at Fredericksburg (13 December) commanded the 3d division of the First Corps, with which he broke through Lee's right and penetrated to the position occupied by the Confederate reserves, but for want of support was compelled to fall back. At Chancellorsville (2–4 May 1863) he commanded the Fifth Corps. On 28 June 1863 he was appointed commander of the Army of the Potomac, to succeed Hooker. His command was then scattered, and on the march through Pennsylvania in pursuit of the Confederate invaders, Meade had everything yet to learn of both his own force and the enemy. At Gettysburg on 1–3 July he won the great and decisive battle with which his name is generally associated. (See GETTYSBURG, BATTLE OF). He received the thanks of Congress and was made brigadier-general, United States army, 3 July 1863. During the remainder of the war he commanded the Army of the Potomac with conspicuous ability, and on 18 Aug. 1864 became major-general in the regular army. From 1 July 1865 until his death he was commander of the military division of the Atlantic, with the exception of the period January 1868–March 1869, when he was in command successively of the Third Military District and the Department of the South. He was a Fellow of the American Academy of Arts and Sciences. A residence was purchased for him by the citizens of Philadelphia, and after his death $100,000 were collected and given to his heirs. There is an equestrian statue of him by Calden in Fairmount Park, Philadelphia, and one by Bush-Brown on the field of Gettysburg. Consult Bache, R. M., 'Life of General G. G. Meade' (Philadelphia 1897); Pennypacker, I. R., 'General Meade' (New York 1901).

MEADE, Richard Kidder, American soldier: b. Nansemond County, Va., 14 July 1746; d. Frederic, now Clarke, County, after 1800. He was educated in England at Harrow and in private schools. He had returned from England some years before the outbreak of the Revolution, and in 1775 entered the service of the struggling colonies, and distinguished himself in his first battle, that of Great Ridge. Recognition came speedily with an appointment to the staff of General Washington, with whom he remained until the close of the war. The supervision of the execution of Major André fell to his lot, a duty which while recognizing the necessity for it, he performed with deep regret. At the conclusion of the war he returned to Virginia to engage in the quiet life of the plantation.

MEADE, Richard Worsam, American naval officer: b. New York, 9 Oct. 1837; d. Washington, D. C., 4 May 1897. He was a nephew of Gen. G. G. Meade (q.v.). He entered the navy as midshipman 2 Oct. 1850. His promotions were lieutenant, 23 Jan. 1858; lieutenant-commander, 16 July 1862; commander, 20 Sept. 1868; captain, 13 March 1880; commodore, 5 May 1892, and rear-admiral, 7 Sept. 1894. On 20 May 1895 he was retired from the service. In 1862–63 as commander of a division he co-operated with the land forces of Sherman in subduing the Confederates on the Mississippi. In 1863 he was in command of the marines during the Draft Riots in New York. For a time he was in charge of a department at the naval academy; in 1868 was sent to Alaska and in 1871–73 commanded the *Narragansett* on the Pacific station. In 1894 he was placed in command of the North Atlantic squadron. He was naval representative of the United States at the World's Columbian Exposition, Chicago,

1893. He published 'A Treatise on Naval Architecture and Ship-building' (1869).

MEADE, William, American Protestant Episcopal bishop: b. near Millwood, Va., 11 Nov. 1789; d. Richmond, Va., 14 March 1862. He was a son of R. K. Meade (q.v.), and was graduated from Princeton College in 1808, studied theology and took orders in the Episcopal ministry in 1811. His first charge was his home parish, which he served gratuitously, and in 1829 he was elected assistant to Bishop Moore. He was in charge of Christ Church in Norfolk, Va., in 1834–36, and in 1841 succeeded Bishop Moore as head of the diocese of Virginia. He was one of the founders in 1847 of the 'Evangelical Knowledge Society.' He tried to keep Virginia in the Union in 1861, but later entered into the spirit and aims of the Confederacy. He was the author of several works, among which are 'Family Prayers' (1834); 'Reasons for Loving the Episcopal Church' (1852); 'Old Churches, Ministers and Families of Virginia' (1857); 'The Bible and the Classics' (1861). Consult the memoir by his coadjutor, John Johns (Baltimore 1867).

MEADOW, Making and Care of. Meadows may be divided into general groups which will depend upon location, duration and purpose, and their treatment will vary with each of these factors. Meadows located upon low ground, which may be inundated, or which is constantly moist, usually consist of grasses and other plants which do not thrive so well upon upland fields. Because of their dampness they cannot be treated like dry soils and they are therefore more frequently permanent than temporary. Further, they are generally better adapted for haying than for grazing, because the grasses that naturally grow upon them are ranker, taller growing species and generally have grown to a considerable height before the land becomes dry enough to turn stock upon it. Except as to season the preparation of lowland meadows is not necessarily different from that of upland.

For best results the land should be deeply plowed as early in the season as soil conditions will permit, and harrowed at intervals of 10 days and after each rain that forms a crust until late summer. The practice will not only destroy weeds and weed seeds, but ensure the quick germination of grass seed sown even in dry weather, the soil being moist close to the surface. The soil may be anything, but preferably not sand or clay. If mucky, as in a reclaimed swamp, rolling is frequently advisable, otherwise generally not. Prior to plowing liberal applications of good manure or commercial fertilizers should be made and light annual dressings should also be given, preferably in autumn or early spring. Temporary pastures which are intended to last only three or four years should constitute part of a general rotation scheme (see ROTATION OF CROPS) and should be followed by some crop such as corn or potatoes, which can best utilize their products of decomposition. Permanent meadows should be inspected each spring and the spots which appear to be failing given special attention, such as fertilizing, liming, seeding, etc., to maintain a general good average. When the annual yield of hay falls below two tons the meadow may be considered unprofitable and should be plowed up and given a change of crop for three or four years.

In general, timothy or "herd's-grass" is the most popular grass in America, because it is hardy, long-lived, large, easily cured and its seed inexpensive and likely to be free from weed seed. Orchard grass, tall meadow fescue, red-top, rye-grass and cat-grass are also often used, but are secondary. Blue-grass, which generally appears as a volunteer grass in permanent meadows, is rarely profitable as a hay grass, but is unequaled in the north as a pasture grass. These grasses may all be sown with a sparsely planted cereal which acts as a "nurse crop." But this practice is generally considered inexpedient. The admixture of clover, however, is generally highly desirable, since the clovers supply nitrogenous food to the grasses. Alsike clover is considered best for mixing with timothy since it is somewhat later in ripening than the other large clovers, which mature before the timothy can be profitably cut. Consult Wing, Joseph E., 'Meadows and Pastures' (Chicago 1911).

MEADOW-BEAUTY. See DEER-GRASS.

MEADOW FESCUE, a fescue-grass (*Festuca*). See GRASSES IN THE UNITED STATES.

MEADOW-GRASS. See BLUE-GRASS.

MEADOW-HEN, the American coot. See COOT.

MEADOW-LARK, or **MEDLARK,** a beautiful American starling (*Sturnella magna*), numerous in eastern United States as far west as the high central plains, where it is replaced by a variety (*S. neglecta*) remarkably different in song and some habits. It is about 11 inches long and tail five inches. The body is thick and stout, the legs large, the bill long and straight and the flight powerful. The upper parts are brown, marked with brownish-white, and the exposed portions of the wings and tail with transverse dark-brown bars; the under parts yellow, with a black crescent upon the breast, which is very distinctive as well as a handsome ornament. These birds receive their popular name "lark" from their terrestrial habits and way of singing in the air, uttering a loud sweet double call while circling upon fluttering wings above the meadow or grain-field where the nest is carefully concealed among the roots of the grasses. The eggs are white, profusely speckled with light red. The western variety has a longer, more vivacious and tuneful song than the eastern bird, and is justly accounted the finest songster of the open regions of the interior. These birds are migratory in the northern parts of their range, but most of them remain during the winter in the middle parts of the United States and southward, and in the autumn are often shot for market, although in most States such shooting is now prohibited by law. In the Southern States it is commonly called "old-field lark." The meadow-lark subsists both on insects and on seeds. In winter they often form groups, but in the fine seasons seldom more than two are seen together. Consult Coues, 'Birds of the Northwest' (Washington 1874).

MEADOW-MOUSE. See FIELD-MICE.

MEADOW-PINK, or **MEADOW-CAMPION**, the common cuckoo-flower (q.v.), or ragged robin (*Lychnis flos-cuculi*). See LYCHNIS.

MEADOW-RUE, a plant of the crowfoot family and of the genus *Thalictrum*. These rues are erect perennial herbs, with much divided leaves and small flowers, usually in loose panicles. The genus contains about 75 species, scattered about the north temperate zone, of which the United States and Canada possess about 15 species. The early meadow-rue (*T. dioicum*) is a slender, leafy species, of rocky woods, a foot or two in height, whose flowers, purplish and greenish with yellowish anthers, appear in April or May. The purple meadow-rue (*T. dasycarpum*), common in New England woods, is distinguishable by its size (two to four feet tall), large bright-green, waxy leaves and purplish stem; the flowers form a greenish fleecy bloom. A third large species is the thick-leaved (*T. coriaceum*) of the Southern States, whose flowers are of different hues, the staminate flowers being white and showy, while the pistillate flowers, borne on separate plants, are purplish. The tall meadow-rue (*T. polygamum*) towers to a height of 10 feet in favorable situations. All are fertilized mainly by the wind.

MEADOW-SNIPE. See JACK-SNIPES.

MEADOWSWEET, a well-known handsome European plant (*Ulmaria ulmaria*) of the rose family. It grows by the sides of streams and in damp places, has pinnate leaves and stems two feet high bearing corymbs of white fragrant flowers. A decoction of it with copperas is used for dyeing black, and the root has been used as a tonic. It is also called queen of the meadow.

MEADVILLE, mĕd'vil, Pa., city and county-seat of Crawford County, on French Creek and on the Erie and a branch of the Pittsburgh, Bessemer and Lake Erie railroads, about 90 miles north of Pittsburgh and 30 miles south of Erie. The first settlement was made in May 1788 by David Mead and others. It became a borough in 1823 and in 1866 was chartered as a city. It is in a fertile agricultural region, in the vicinity of extensive oil fields and in the part of the State noted for its iron and steel industries. The chief manufacturing establishments are the Erie Railroad shops, the Phœnix iron works and the Meadville malleable iron works, the Keystone vise works, chocolate chips factory, Barbour silk mills, shoe-button fastener works, silk mills, printing works, confectionery factories, engine works, tool, casting and brass works, chemical works, corset factories and other manufactories. The city has many churches, an academy of music, courthouse, three parks, the county fair grounds, a race-track, iron bridges and several fine wholesale and retail buildings. Its educational institutions are the public and parish schools, a high school, the Meadville Theological School, opened in 1844 by the Unitarians; Allegheny College, opened in 1815 by the Methodist Episcopals; Pennsylvania College of Music, Meadville Business College and a public library. There are the City Hospital and Saint Joseph's Hospital. The three banks have a combined capital of over $350,000. The government, according to the commission plan adopted in 1913, is vested in a mayor and four councilmen. The electric-light plant and the waterworks are owned and operated by the city. Pop. 12,780.

MEAFORD, Canada, lake port in Gray County, Ontario, situated on an inlet of Georgian Bay, Lake Huron, on the Grand Trunk Railway, 20 miles west-northwest of Collingwood. It has brick yards, grain elevators, fruit evaporating works, flouring mills, tannery, furniture factory, textile works, foundries, box works, etc. It has a good harbor with a depth of 20 feet. Pop. 3,200.

MEAGHER, mā'hĕr, **Thomas Francis**, Irish-American soldier: b. Waterford, Ireland, 3 Aug. 1823; d. near Fort Benton, Mont., 1 July 1867. He was educated at the Jesuit College, Clongowes Wood, Kildare, and at Stonyhurst College (near Preston), England; became one of the principal orators of the Young Ireland party, which aimed at independence through armed revolution; in 1848 was sent on a mission by the Irish Confederation to the French provisional government; and on 21 March was arrested on a charge of sedition. He was bailed, but on the passage of the Treason-Felony Act rearrested; and in October sentenced to death for treason. The sentence having been commuted to life banishment, he was removed to Tasmania (9 July 1849); but in 1852 escaped to the United States, where he was admitted to the bar in 1856 and practised in New York in 1856–61. For some time also after 1856 he edited the *Irish News* of New York. In 1861 he organized a company of zouaves for the Federal army, with which he joined the 69th New York Volunteers, under command of Col. Michael Corcoran. After three months' service, he recruited the "Irish brigade" (1861–62), and was elected colonel of the 1st regiment. On 3 Feb. 1862 he became brigadier-general and took command of the brigade. He fought bravely at Richmond, the second Bull Run, Fredericksburg and Antietam and after Chancellorsville found his command so reduced in numbers that he resigned. Early in 1864 he was reappointed brigadier-general of volunteers and was assigned to the command of the military district of Etowah. He resigned 15 May 1865, was appointed secretary of Montana Territory and in the following year acted at one time as governor *pro tem*. At Fort Benton, Mont., on 1 July 1867 he boarded a steamer for a trip down the Missouri and thereafter was never seen. It is supposed that he fell overboard unperceived during the night. He wrote 'Speeches on the Legislative Independence of Ireland' (1852). Consult Cavanagh, 'Life, Writings and Speeches' (Worcester, Mass., 1892).

MEAGRE. A fish. See MAIGRE.

MEAKIN, mē'kĭn, **Budgett**, English author and writer: b. Ealing Park, England, 8 Aug. 1866; d. London, 26 June 1906. He was educated at the Reigate Grammar School, became associate editor of *Times* of Morocco and was editor 1884–93. He lectured extensively on industrial questions and on Oriental subjects. Among his works are 'The Moorish Empire' (1899); 'The Land of the Moors' (1901); 'The Moors' (1902); 'Model Factories and Villages,' etc.

MEAL-MOTH, or **MEAL-WORM.** See FLOUR AND MEAL INSECTS.

MEAL-TUB PLOT, *in English history,* an alleged conspiracy, concocted in 1679 by an informer, Dangerfield, with the view of cutting off those who were opposed to the succession of James II after he had embraced Roman Catholicism. The false charges to which Dangerfield was prepared to swear were found in the meal-tub belonging to a Mrs. Cellier, one of his friends. Ultimately he confessed his crime, was whipped and condemned to stand in the pillory.

MEALY-BUG, a scaleless scale insect of the genus *Dactylopius* and family *Coccidæ.* These insects are covered with a mealy or waxy substance which they secrete for protective purposes. Like their relatives, the true scale insects, they also secrete honey-dew and are attended and transported by ants; unlike these relatives they do not lose the power of locomotion. The species are most numerous in tropical and sub-tropical countries; one species (*D. citri*) being the best-known outdoor species in the United States, feeding upon citrus trees in Florida. In greenhouses another species (*D. destructor*) is often troublesome. Owing to the protective covering difficulty has been met in ridding plants of these creatures, but fumigation and caustic solutions have been tried with most satisfactory results, a kerosene and soap emulsion being particularly effective in destroying them. (See INSECTICIDE). Consult Comstock, J. H. and A. B., 'Manual for the Study of Insects' (8th ed., New York 1909); Comstock, J. H., 'Report of the United States Department of Agriculture' (Washington 1880).

MEALY WING, a minute bug of the family *Aleyrodidæ,* whose species (about 150 in number) have the wings covered with a white meal-like secretion. They are allied to the coccids, but differ in development and structural peculiarities; and throng upon the leaves of plants which they injure by sucking away the sap and also by attracting a growth of smut-fungus by their secretion of honey-dew. In this manner they blacken and harm orange and lemon trees in parts of Florida and Louisiana, where they are prevalent. Consult Howard, 'Insect Book' (1901).

MEAN VALUE. If n quantities are commensurable, the sum of their units divided by n, the number of the quantities, is the *arithmetical mean* and is the *mean value* of the n quantities when their number is finite. For example, if the number of units in three quantities are respectively 4, 8 and 15, the mean value is $\frac{4+8+15}{3}=9$; and in general, if the number of units in n quantities is denoted by $X_1, X_2, X_3, \ldots . X_n$, the mean value is

$$M=\frac{1}{n}(X_1+X_2+X_3+ \ldots . +X_n).$$

But if a quantity vary continuously in accordance with some law, thereby assuming every possible value between two extremes, the number of different quantities is infinite, and the mean value in such a case requires a new definition. For example, assume that at every point in the diameter of a semi-circle a perpendicular to the diameter is drawn to meet the semi-circle. The lengths of these lines form a continuous series of values represented by every number from zero to r, where r is the length of the radius. In such a case if n values of the perpendiculars are obtained and their sum is divided by n, the ratio should approximate to the mean value. It is easy to see, however, that this ratio will approximate to $\frac{2}{\pi}$ of the radius of the circle if the n perpendiculars are evenly spaced on the circle, to $\frac{\pi}{4}$ of the radius if they are evenly spaced on the diameter. It follows that the mean value of a continuously varying quantity is not definite until the law is known by which the "weight" of each portion of the scope of variation is determined.

The several forms of the theorem that pass under the name of the mean value theorem involve the principles of the infinitesimal calculus. The *first theorem of the mean value* is the following: Let $f(x)$ denote any finite and continuous function of x in the interval between $x=x_0$ and $x=X$; let dx denote the increment and retain the same sign in this interval; and assume that m and M are respectively the least and the greatest values of $f(x)$ in this interval: then the definite integral $\int_{x_0}^{X} f(x)dx$ has a definite value that is greater than $m(X-x_0)$ and less than $M(X-x_0)$; that is,

$$m\int_{x_0}^{X}dx<\int_{x_0}^{X}f(x)dx<M\int_{x_0}^{X}dx.$$

Since $f(x)$ is continuous in the interval $X-x_0$, there must be a value $x=\xi$, where $x_0<\xi<X$ such that $\int_{x_0}^{X} f(x)dx=(X-x_0)f(\xi)$, $m<f(\xi)<M$. The value, $f(\xi)=\frac{1}{X_0-x}\int_{x_0}^{X} f(x)dx$, is called the *mean value* of $f(x)$ in the interval $X-x_0$. If we assume $F(x)$ to be the primitive or indefinite integral of $f(x)$, then $F(X)-F(x_0)=(X-x_0)f(\xi)=(X-x_0)F(\xi)$ which is the familiar form of the law of the mean in the differential calculus.

The theorem of mean value is of importance in establishing Taylor's series. It follows immediately from the theorem of mean value that if $F(X)=F(x_0)=0$, for some ξ between X and x_0. $F'(\xi)=0$, if F is continuous between X and x_0. Let ϕ be a function of X with derivatives of every order at every point between $x=a$ and $x=b$. Construct the function

$$\psi(z)=\phi(X)-\phi(z)-(X-z)\phi'(z)-\frac{(x-z)^2}{a!}\phi''(z)$$
$$-\ldots .-\frac{(x-z)^n}{n!}\phi^{(n)}(z)-\frac{(x-z)^{n+1}}{n+1}p,$$

where X is of the form x_0+h, and X and x_0 lie between a and b. ψ' will be of the form $-\phi'(z)+\phi'(z)-(X-z)\phi''(z)+(X-z)\phi''(z)-\ldots-\frac{(X-z)^n}{n!}\phi^{(n+1)}z+\frac{(X-z)^n}{n!}p$, or

$$\frac{(X-z)^n}{n!}[p-\phi^{(n+1)}(z)].$$

Furthermore, $\psi(X)$ is identically 0, and by properly choosing P, $\psi(x_0)$ can be made 0.

Therefore, by the theorem just stated $\psi'(z) = \frac{(X-z)^n}{n!}[p-\phi^{(n+1)}(z)]$ vanishes for some value of z between x_0 and x. As it can be shown that this value need not be X itself, we have $p-\phi^{(n+1)}(z)=0$ for some value of z between x_0 and X, and since $\psi(X)=0$, if we let $X=x_0+h$, we have $\phi(x_0+h)=\phi(x_0)+\phi'(x_0)h+\ldots.+\frac{\phi^{(n)}(x_0)}{n!}h^n+\frac{\phi^{(n+1)}(x_0+\vartheta h)}{(n+1)!}h^{n+1}$, where $0<\vartheta<1$. Therefore, if $\frac{\phi^{(n+1)}(x_0+\vartheta h)}{(n+1)!}h^{n+1}$ can be made as small as you please by increasing n, we have $\phi(x_0+h)=\sum_0^{\infty}\frac{\phi^{(n)}(x_0)h^n}{n!}$, which is Taylor's theorem. See SERIES. Consult Osgood, 'Differential and Integral Calculus' (rev. ed., New York 1914).

MEANDER, mē-ăn'dėr, *in art,* an ornamental design, in which the lines interlace; it is often used in decorating vases. The lines usually advance in one direction and pass one another at right angles. The design is so named from the river Meander, well known for its numerous windings.

MEANDERS, broad swinging curves made by a river on its flood plain. A river in its early history may have accidental curves, but it is only when it has cut its course as deeply as it can, and has begun to widen its valley notably, in other words when it has passed its maturity and is progressing toward old age, that it characteristically develops meanders. These frequently become almost perfect loops many miles around and but a few rods across the neck. When a meander cuts off and is occupied by stagnant water only, ox-bow lakes are formed. If a region in this stage is uplifted the river will again begin to deepen its valley, and the meander curves will cut down anew, forming deep valleys or gorges. They are then said to be entrenched or incised meanders. Sometimes the neck of an incised meander may be cut through at river level, by undermining the rock, leaving a natural bridge. See NATURAL BRIDGES, and the section on *Work of Running Water* in the article on GEOLOGY.

MEANING, the object of a symbolization, considered from the standpoint of the symbol. Thus the meaning of the figure 2 is the number two, the meaning of the formula $(x+y)^2=x^2+2xy+y^2$ is the law that formula represents, and so on indefinitely. The experiences which we undergo possess besides their presented content a represented content, and this represented content bears toward them the relation of meaning. One of the cardinal problems of modern psychology is the determination of the psychical concomitants of this meaning. In accordance with the general nominalistic and associationalistic trend of experimental psychology, those who approach the question of meaning from this angle have usually considered that the meaning of an image is conveyed in consciousness by a group of such accompanying substantive states as images, sensations and feelings. They held, that is, that the meaning of "bear" read into a noise in the woods is "carried by a verbal image and an organic shudder," and that every experience is surrounded by a fringe of vaguer meaningful states. They would consider that the vehicle of the law of universal gravitation is a visual or auditory verbal image, together with certain organic and kinæsthetic sensations.

All this psychology of meaning suffers from the lack of an antecedent logical analysis. The logical situation best adapted to this analysis is that of the relation of a set of mathematical symbols to the theory they represent. The theory is obviously the meaning of the symbols, but it is only to the very slightest extent carried by the individual symbols themselves. Only the elementary constituents of the system, together with certain of the simpler general notions, are represented by special characters. The structural relations are signified, and must be signified, by the arrangement — that is, the structural relations of the symbolism on the paper. The essence of the conventional system of algebraic notation lies, not in the use of letters for numbers, not in the symbolizing of addition by + and of multiplication by ×, but in the agreement between the laws of the manipulation of the symbols and the laws of number. Symbolization is primarily the relation toward a system of entities of a similarly order system of arbitrary marks, and only in a derived sense the relation between a mark and the corresponding entity. The symbol is a symbol only within a symbolism. It is precisely as a symbolism that our verbal images, kinæsthetic sensations and other mental states convey a meaning. When the mathematician is developing a new theorem, his mental content may be inventoried as a verbal image or two, his sensation of the paper and pencil in front of him, and a few organic sensations. Somehow or other he puts these into an entirely extraneous correlation with the entities which he is examining. This strain behind the eyeballs acquires a temporary association with the unknown function for which he is seeking; that fragmentary visual image of a formula represents a mathematical law; and so on. In his trained mind, the symbolism of his states shapes itself into the desired conclusion, which he symbolizes anew in the conventional algebraic notation on the paper lying before him. No enumeration of his substantive states can ever disclose how the meaning of the conclusion and the premises is carried in his mind, for it is not these states themselves, but their arrangements, that are the vehicles of meaning.

This structural nature of the vehicle of meaning is intimately connected with our power to communicate with others. My sensation of red is something that as far as I know may be peculiarly mine. If there were a man who from his birth had seen red where I see green and green where I see red, it would be a matter of the utmost difficulty for me to detect his anomaly. He would learn the name "red" from hearing it applied to the things which appear red to me but green to him, so that his speech would not disclose his peculiarity. It is only by observing that green objects excite in him the expression of the emotions which we consider appropriate to red, or by some similar peculiarity in the associations of his experience of red and green objects, that the interchange of his red and green sensations could even be sus-

pected. If the interchange were his sole peculiarity, he would always consider himself, and be considered by others, in the light of a normal human being. Accordingly, we have no reason to believe that the sensory qualities or sense-data of normal human beings agree with our own sensory qualities and sense-data, and there is no way of conveying these qualities and data by language. On the other hand, language is the vehicle of meaning and of nothing else. This alone is enough to prove that the meanings do not reside in any special data or qualities in our minds. What language does is to order the mind of the hearer or reader in a manner similar to that of the speaker or writer. In reading a story we pass through a sequence of mental states which has been designed for us by the author, though our individual states are beyond his knowledge. When he uses the word "green," we interpret it in our own way, but we put it in the same sort of relational context — complementary color of red, intermediate between yellow and blue, etc.— as that which it occupies in his mind. It, therefore, follows that this relational context, which is all that language can convey, is identically the meaning conveyed by language.

The situation when we hear a noise in the bushes and interpret it as "bear" can now be analyzed. The meaning is not carried in the first instance by the verbal image and the shudder. It is true that there is a possible state of consciousness in which the rustle in the bushes, the verbal image, and the shudder are all that is present, but at this stage meaning has not yet appeared. Meaning first appears when we think, not "bear," but "That's a bear." In this case, the rustle in the bushes stands for "that," the shudder or verbal image for "bear" and the juxtaposition of the shudder or image with the sound impression for the relation expressed in the sentence. The meaning of "bear" is derived from the meaning of the sentence. In other words, the meaning of the sound in the bushes resides, not in its correlates, but in its correlation. (See THOUGHT). Consult James, W., 'Principles of Psychology' (New York 1899); Stout, G. F., 'Manual of Psychology' (London 1913); Titchener, E. B., 'Experimental Psychology of the Thought Processes' (New York 1909).

NORBERT WIENER.

MEANS, mēnz, **David MacGregor**, American lawyer and author: b. Groton, Mass., 1 May 1847. He was graduated from Yale in 1868, studied theology at Andover and New Haven, was professor of economics in Middlebury (Vt.) College in 1877–80, and in 1881 was admitted to the bar and entered the practice of law. He contributed to periodicals, and wrote 'The Boss' (1894); 'Industrial Freedom' (1897); 'The Methods of Taxation' (1909).

MEANS GRASS. See GRASSES IN THE UNITED STATES.

MEANTONE, or MESOTONIC TEMPERAMENT, *in music,* the system or principle of tuning voices or instruments in vogue up to the middle of the 19th century, when it was superseded by the system of equal or even temperament. In the meantone temperament, tuning was based on the use of a standard whole step or mean tone, which is an interval between a greater and a less major second. See MODE; WELL-TEMPERED CLAVIER.

MEARES, mērz, **John,** English navigator: b. England, 1756; d. London, 1809. He entered upon a seafaring life at an early age and in 1771 he entered the navy and served in the war with the French until peace was declared in 1783, when he became a captain in the merchant service. In 1786 he explored the coast of Alaska and made in 1789 a second tour of exploration on the discoveries of which the British government based its claim to the possession of British Columbia and Oregon. Three ships sent by him to Nootka Sound in 1789 were captured by the Spaniards and this act caused England to fit out an expedition in the following year, upon which reparation was made by Spain. He was the author of 'Voyages in the Years 1788–89, from China to the Northwest Coast of America' (1790).

MEARIM RIVER, Brazil, rises in the Sierra do Negro, and after a northerly course of about 360 miles in the state of Maranhão flows into the Bay of São Marcos near the city of Maranhão. It has numerous affluents and is navigable, but the sudden tidal bores are dangerous.

MEARS, Helen Farnsworth, American sculptor: b. Oshkosh, Wis., 1878; d. 17 Feb. 1916. Her early years were passed in Oshkosh, Wis., where she began her art work as a child by carving a life-size portrait of her sister from a block of solid plaster. She studied under Saint-Gaudens, who recommended her as one of the strongest pupils he ever had when he sent her to Frederick Macmonnies in Paris. She was particularly known for her portrait busts. Her memorial statue to Frances E. Willard in the capitol at Washington (1905) was the first statue of a woman by a woman placed in that building. In 1911 her design was accepted for a statue for the new Wisconsin State house. Before that she had done much work of note, including the MacDowell basreliefs, familiar to visitors at the Metropolitan Museum, New York, and at the MacDowell Club; a 'Fountain of Life,' which won a prize at the Saint Louis exposition. Other works are the portrait relief of Augustus Saint-Gaudens and the portrait busts of George Rogers Clark and William L. G. Morton, M.D., in the Smithsonian Institution, Washington.

MEARS, James Ewing, American surgeon: b. Indianapolis, Ind., 1838. He was graduated at Trinity College, Conn., in 1864, and at Jefferson Medical College, Philadelphia, in 1865. He served in the Civil War and in 1865 established his practice in Philadelphia. He held the chair of anatomy and surgery at the Pennsylvania College of Dental Surgery from 1870 to 1898 and for many years was surgeon-in-chief of the Pennsylvania National Guard. He published 'Practical Surgery' (1878; 2d ed., 1885), and numerous contributions to surgical journals.

MEASLES (also called RUBEOLA and MORBILLI), a highly contagious eruptive disease, frequently epidemic, and sometimes dangerous because of its debilitating effects and tendency to end in inflammation of mucous membranes, such as pneumonia and enteritis. So-called black or malignant measles, occurring mostly in persons

of very poor health, is usually fatal. Where frequently epidemic it is less likely to be severe, and where it attacks a community for the first time it has a high mortality. For instance, it was taken to the Fiji Islands by a British ship from Australia and swept away 40,000 out of 150,000 inhabitants. Although measles is a disease of childhood, adults are not exempt from it. As a rule it attacks an individual but once. The contagious principle exists in the breath and in exhalations from the skin, the tears, the nasal and bronchial secretions and the excretions. Clothing which has been in an infected atmosphere is liable to spread the disease. How long the contagium remains in infected articles is not known. The disease may be divided into four stages, beginning with the stage of incubation, or the interval (varying from 7 to 21 days) between the date of infection and the outbreak of symptoms, that is, the stage of invasion. The symptoms are chilliness, fever, pain in head, back and limbs, bloodshot eyes, with intolerance of light, running of the eyes and nose, sneezing and a troublesome cough. About the fourth day an eruption or rash appears (stage of eruption), first in the throat, then upon the face, trunk and extremities, as minute pinkish red spots, which coalesce into blotches more or less crescentic in shape, raised above the surface of the skin. The eruption usually last about three or four days. Gradually disappearing (stage of decline), fever and catarrhal symptoms abate, and appetite returns. The cough may remain for days. The patient should be kept in a warm, well-ventilated and fairly lighted room, should be given easily digested food and plenty of water. Treatment should also regulate the bowels with saline medicines, and allay the severity of the cough with simple remedies. Severe symptoms require the attendance of the physician. Complications may ensue in the shape of chronic inflammation of the tonsils, of laryngitis, of chronic Bright's disease and of otitis; but the most serious complication is that of bronchopneumonia, which occurs in about 25 per cent of cases of measles. Measles is contagious until the eruption has disappeared and all dead particles of skin have come away of themselves or have been washed off by tepid baths.

MEASURE, a definite unit of capacity or extent, fixed by law or custom, by which relative sizes and capacities are ascertained and expressed; as, a yard, a measure of length; a gallon, a measure of capacity; a square foot, a measure of area; a cubic foot, a measure of volume, etc. See WEIGHTS AND MEASURES.

Lineal Measure.— The measure of lines or distances; the standard unit of lineal measure in the United States is the yard. The system is based on the law of nature that the force of gravity is constant at the same point of the earth's surface, and, consequently, that the length of a pendulum which oscillates a certain number of times in a given period is also constant.

Unit of Measure.—A given quantity, used as a standard of comparison in measuring a quantity of the same kind. Every kind of quantity has its own unit of measure, and under different circumstances the same kind of quantity may have different units of measure.

Line of Measures.— The line of intersection of the primitive plane, with a plane passing through the axis of the primitive circle and the axis of the circle to be projected.

Measure of Angles.— The right angle being taken as the angular unit, its subdivisions are degrees, minutes and seconds. The right angle contains 90 degrees, the degree 60 minutes and the minutes 60 seconds. All smaller fractions are expressed decimally in terms of the second.

Measure of Magnification.— The measure of magnification, or magnifving power of any optical instrument, is the ratio of the magnitude of the image to the magnitude of the object, or, more precisely, the ratio of the apparent diameter of the image to that of the object.

Measure of a Ratio.— Its logarithm, in any system of logarithms, or the exponent of the power to which the ratio is equal, the exponent of some given ratio being assumed as unity.

In Music.— The quantity of notes which are placed in the bar, and which is generally called the time, of which there are but two kinds, namely, common time, containing an equal quantity of notes in the bar, and triple time, containing an unequal quantity. Common time is generally marked with a C at the beginning, which means that every bar contains four crotchets, or their value in other notes. There are also other kinds of common time which are marked $\frac{2}{2}$, $\frac{4}{4}$, $\frac{8}{8}$. Triple time is marked $\frac{3}{2}$, $\frac{3}{4}$, $\frac{3}{8}$, $\frac{3}{16}$, $\frac{3}{32}$.

MEASURE FOR MEASURE is the most characteristic of the group of so-called «dark comedies» produced in Shakespeare's middle period. Modern critics are agreed that 'Measure for Measure,' first printed in the 1623 folio, must have been composed about 1603; and the critics' opinion, based almost solely upon evidence of style, can now be confidently supported by a piece of external evidence lately redeemed from suspicion of forgery; namely, a memorandum in the accounts of the royal Revels Office which records that 'Measure for Measure' by «Shaxberd» was performed before King James by His Majesty's Players on Saint Stephen's night, 26 Dec. 1604. Few of Shakespeare's greater works are so unequal in quality or have evoked such diverse opinions. In certain details of form it is one of the most careless of the plays. The subject is intrinsically displeasing to modern taste (though vastly more refined here than in the original story); several of the characters (notably the goody-goody Duke and the unmanly Claudio) repel the reader; and many of the devices of plot, especially in the perfunctory closing act, are frank clap-trap. On the other hand, Shakespeare's moral beauty and dramatic brilliance are nowhere more loftily exemplified than in the best scenes — those, namely, in which Isabella's gracious figure appears. In a word, this play marks, and is the first to mark, the complete ascendency of spirit over form so notable in the last plays of 8 or 10 years later; it is the earliest to make conspicuous Shakespeare's utter heedlessness of rules and details and his uncanny splendor in silhouetting moral beauty against an all-encompassing mundane vileness. «This is a play as full of genius as it is of wisdom,» says Hazlitt, and Masefield in a notable appreciation calls it «one of the greatest works of the greatest English mind.» There is no evidence that 'Measure for Measure' has ever been much performed (except in Germany), though an injudicious attempt to blend it with 'Much Ado about Nothing' ('The

Law against Lovers,' by Sir William Davenant) was popular in the latter half of the 17th century. Yet two English revivals in 1907 and 1908 (one by the company of Oscar Ashe and Lily Brayton, the other by the Oxford University Dramatic Society, supported by actresses) proved marvelously impressive. They fully established both the serene morality of the piece when honestly presented and also the genuine effectiveness of the usually slighted comic scenes. Shakespeare's source was a long, flashy play in two parts (10 acts), 'Promos and Cassandra,' by George Whetstone (1578), which in its turn is derived from an Italian tale in Cinthio's 'Hecatommithi.'

TUCKER BROOKE.

MEASUREMENT OF SHIPS FOR TONNAGE, or **BUILDER'S MEASUREMENT,** a method of computing the tonnage of merchant vessels, in use among shipbuilders. Its results are nearly double the legal or registered tonnage. See TONNAGE.

MEASUREMENT OF STREAMS. One of the many useful classes of work conducted by the United States Geological Survey; the measurement of streams having an industrial value. Wherever water is likely to be employed for power or irrigation the amount available is ascertained by that bureau. The volume varies greatly from season to season, and sometimes from year to year. Any calculation by the manufacturer or farmer which does not take this variability into account would be misleading. Moreover, streams differ among themselves in straightness, the character of their beds and other particulars. Accurate measurement is still further complicated by the lack of uniformity in the movement in a given cross section. What might be true for one point would not be true for other points to the right or left of it, or at a higher or lower level.

The first step in the work is to place a gauge in a permanent position, and employ a suitable observer to read it every day. The gauge is graduated to feet and tenths. Usually it is upright. It may be laid over slanting, however. In that case, the spacing is widened, so as to give accurate results. One observation a day is made, and its results transmitted on a postal card to Washington. The second factor in the hydrographer's computation is the velocity of the stream, at different heights. To ascertain this only occasional measurements are necessary. These are made by experts, but with their aid it is possible to prepare tables showing the total discharge of that particular stream for all the different gauge readings. After such tabulation is effected the maximum, minimum and mean flow for any month in the year can be told at a glance.

Velocity is ascertained with a meter lowered into the water. The instrument contains a tiny screw propeller, the number of whose rotations under the pressure of the fluid is automatically registered. Many types of meter have been devised. The kind which the bureau prefers has an electric wire leading up to a buzzer in the operator's pocket. There a click or other audible sound indicates to him the speed of the screw. He counts the number of revolutions for some definite period, usually fifty seconds, records it in his notebook and moves along a short distance to make another observation.

If measurements are made at various depths along a vertical line, the results will not be equal. For this reason hydrographers have studied to find, if possible, a level that would fairly represent the average velocity for any vertical. In this way they can simplify the labor. It has been found that such an average can be secured by taking the speed at a depth of from six-tenths to two-thirds of the way down from the surface. To obtain a correct idea for the whole stream, though, these tests must be made at a number of places between one shore and the other. No measurement at a single point can be trusted to be fairly representative.

MEASURING WORM, INCH WORM, LOOPER, or **SPAN-WORM,** a caterpillar of any species of moth of the superfamily *Geometridæ.* The creatures are characterized by the presence of only two pairs of abdominal legs, one upon the ninth, the other upon the anal segment, and by their peculiar form of locomotion, the rear of the body being brought forward toward the front legs and the body forming a loop at right angles to the surface upon which the insects walk. Nearly all the numerous species feed upon foliage, a few upon seeds in which they bore. Some are considered serious pests in orchards and upon shade trees; for instance, the canker worms (see APPLE, *Insects*), the lime-tree moth (*Hybernia tiliaria*), and *Cymatophora pampinaria,* which sometimes devastates cranberry plantations. The duration of the larva state is variable; from their great voracity they grow rapidly and shed their skins several times before attaining maturity; when arrived at this state they seek some sheltered spot in which to undergo the change to pupa form, some clinging to the lower surfaces of leaves while others bury themselves in the earth, those remaining in the air suspending themselves in various ways by means of their silky secretions, others enclosing themselves in silky cocoons. Those burying themselves also build cocoons around them, but many of these only line their cavity with enough silken threads to keep the wall from falling in. One of the European species, *Fidonia Plumistaria,* is distinguished by curious feathery antennæ. The caterpillars of this species are very injurious to fruit trees, especially those of the European magpie moth, *Abraxas grossulariata,* which inhabit gooseberry bushes, often entirely stripping them of their foliage. The caterpillar of the American canker worm moth, *A. nisopteryx pometaria,* also belongs to this species of worm, the eggs being hatched in the spring; when grown they are about an inch long and of various colors, and are also dangerous to orchards. Most of the species, however, are of small economic importance. The caterpillars usually resemble twigs when at rest, their protective coloring and their attitudes serving to deceive their enemies. The caterpillars of a few species of the owlet moths, family *Noctuidæ,* walk in this way, since they also lack prolegs upon the middle abdominal segments. They are not, however, considered true measuring worms. The geometrid moths are usually of small size and inconspicuous but delicate and beautiful coloration. Consult Holland, 'The Moth Book' (New York 1903); and Packard's 'Monograph of the Geometridæ,' with colored plates, published by the United States Geological Survey (Washing-

ton 1876); 'Cambridge Natural History' (Vol. VI, London 1899); Comstock, J. H. and A. B., 'Manual for the Study of Insects' (8th ed., Ithaca, N. Y., 1909).

MEAT, Inspection of. The purpose of meat inspection is to eliminate diseased or otherwise bad meat from the general food supply, to see that the preparation of the meats and products passed for human consumption is cleanly; to guard against the use of harmful dyes, preservatives, chemicals or other deleterious ingredients; and to prevent the use of false or misleading names or statements on labels, in short to protect the rights and health of the consumers of meat and meat food products to the fullest extent possible. In the United States the meat inspection service is administered through the Bureau of Animal Industry of the Department of Agriculture.

In 1890, 1891 and 1895 Congress passed legislation empowering the Secretary of Agriculture to take measures to ensure a wholesome quality in all meats in the export trade and to protect the home consumer against diseased or unsound meat. Under the provisions of these laws great dependence was placed on the ante-mortem examination of all animals for export or for interstate commerce, but the provisions for the post-mortem examination of carcasses were inadequate. The great defect of this early legislation was that it did not make a ruling for the disposal of carcasses and animal products which upon examination had been found unfit for use as food. During the war with Spain in 1898 the prevalence of sickness among the enlisted men drew the attention of the public to the laws relating to meat inspection. A report was made that "embalmed beef" was being supplied the army by the great packing-houses. Investigation failed to establish this, however, and the public was apathetic in the matter until the publication of Sinclair's 'The Jungle,' in 1906, in which it was charged that the condition of the slaughter-houses in Chicago, the packing centre of the country, was filthy and that the menace to the public health as a result was very great. The nation was aroused and the Pure Food and Drugs Act of 30 June 1906 was enacted after the investigations of government and other committees had disclosed the astonishing fact that a large part of the meat placed upon the market was far from clean; and that, in fact, the methods of handling and preparing these food products were dangerous to health.

Federal inspection is now maintained under the act of 30 June 1906, and supplementary legislation in the Tariff Act of 3 Oct. 1913. The food animals to which the act refers are cattle, sheep, swine and goats. The slaughtering, packing, rendering and meat-preparing establishments to which it applies are those which sell or ship their products in whole or in part in interstate or foreign commerce. The Meat-Inspection Law does not apply to those establishments the meats and products of which are neither sold nor shipped outside the confines of the State in which the plant is operated. A qualified exemption from inspection is granted under the law to retail dealers supplying their customers, and a similar exemption is granted in the case of meat from farm-slaughtered animals. The legislation of 1913 provided for the inspection of imported meats and products.

The requirements as to sanitation in the establishments that operate under inspection occupy an important place in the meat-inspection regulations. Prior to 1906 the Secretary of Agriculture was without authority to fix and enforce such requirements but when it was conferred in the act of that year the department proceeded to enforce sanitation in all establishments operated under Federal inspection. The first step taken was to require strict cleanliness as regards the rooms and equipment and in respect to the conduct of operations and the handling of products, and the second was to adopt rules governing plant and equipment construction.

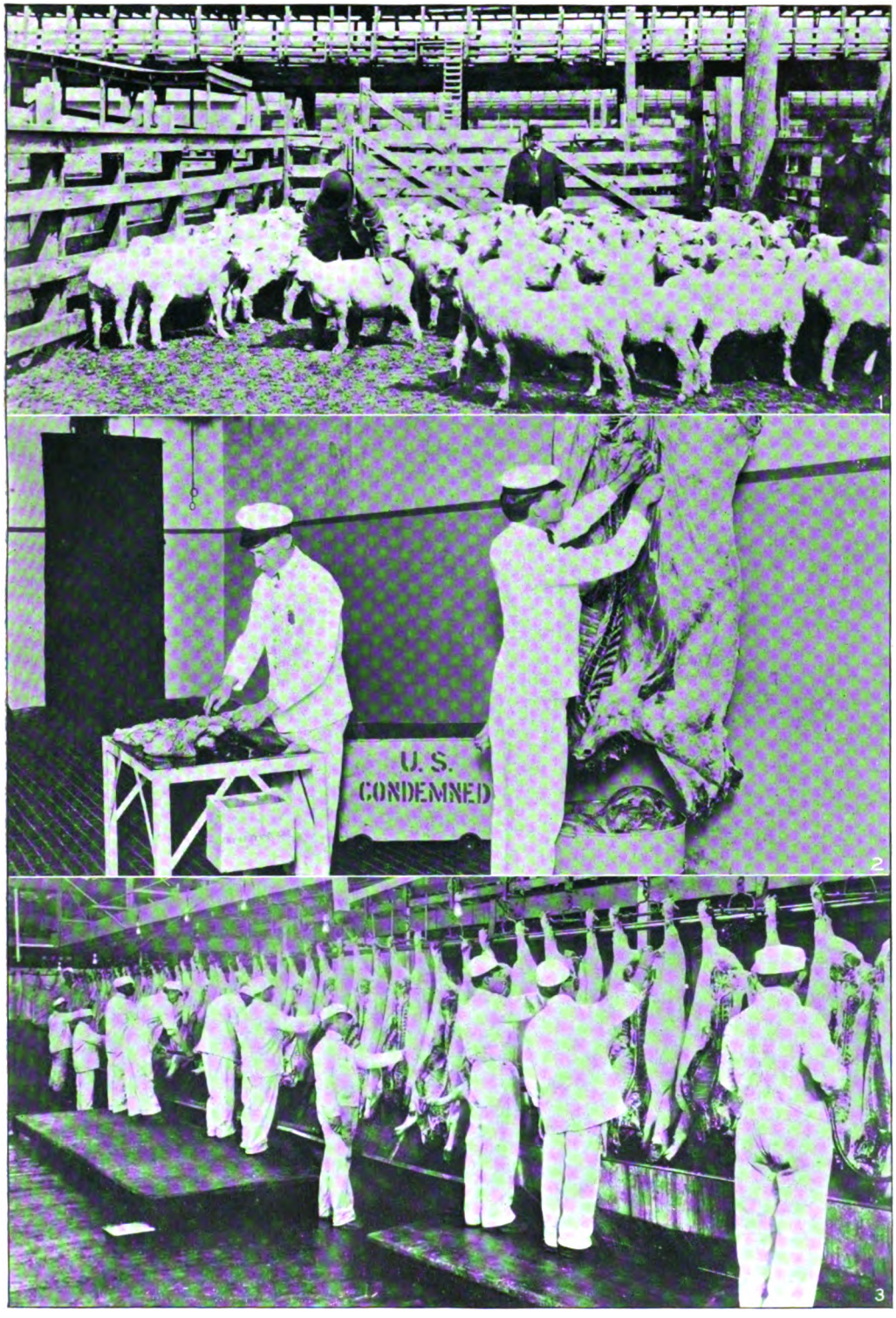
In new plants the use of non-absorbent materials was demanded and natural light supplanted artificial as far as possible. Improved drainage, plumbing and sanitation were demanded as also proper facilities for the conduct of inspection.

Each establishment is given an official number, which must appear in every instance as a part of the mark of inspection, that is, the mark or statement used on meats and products or the containers thereof, to show that they have been inspected and passed under the Federal regulations.

Ante-Mortem Inspection.— Under the Federal system not less than two examinations are made of the animals slaughtered in official establishments. The first is the ante-mortem inspection or examination of the live animal, the second the post-mortem examination of the carcass and the various organs and parts at the time of slaughter. The post-mortem is the more valuable of the two inspections, but both are necessary if it is to be determined with certainty in every instance that the flesh of the animal is sound, wholesome and fit for human food. The ante-mortem examination is performed in the pens and alleys of the establishments, except that at most of the large slaughtering centres it is found more convenient to conduct it in the public stockyards. The animals are carefully observed for evidence of disease or abnormal condition while at rest in the pens or as they move from the scales after weighing. If any of a lot show symptoms, then the entire lot is subjected to further and individual inspection. If the animals are swine and the symptoms indicate cholera, they are driven to a special pen for further examination and in certain cases to ascertain their temperatures and to make a record of the same. Other diseases or conditions in which the question of temperature is important are Texas fever, anthrax, blackleg, pneumonia, septicemia and severe injuries. When its appearance is such as to lead the inspector to suspect that an animal is affected with a disease or condition that may cause its condemnation in whole or in part on the post-mortem inspection, it is marked for identification by means of a serially numbered metal tag bearing the phrase "U. S. Suspect" affixed to the ear. A record of the case is made and sent to the inspector who is to conduct the post-mortem examination. Such suspect animals are kept apart and slaughtered separately from those which were passed on the ante-mortem inspection.

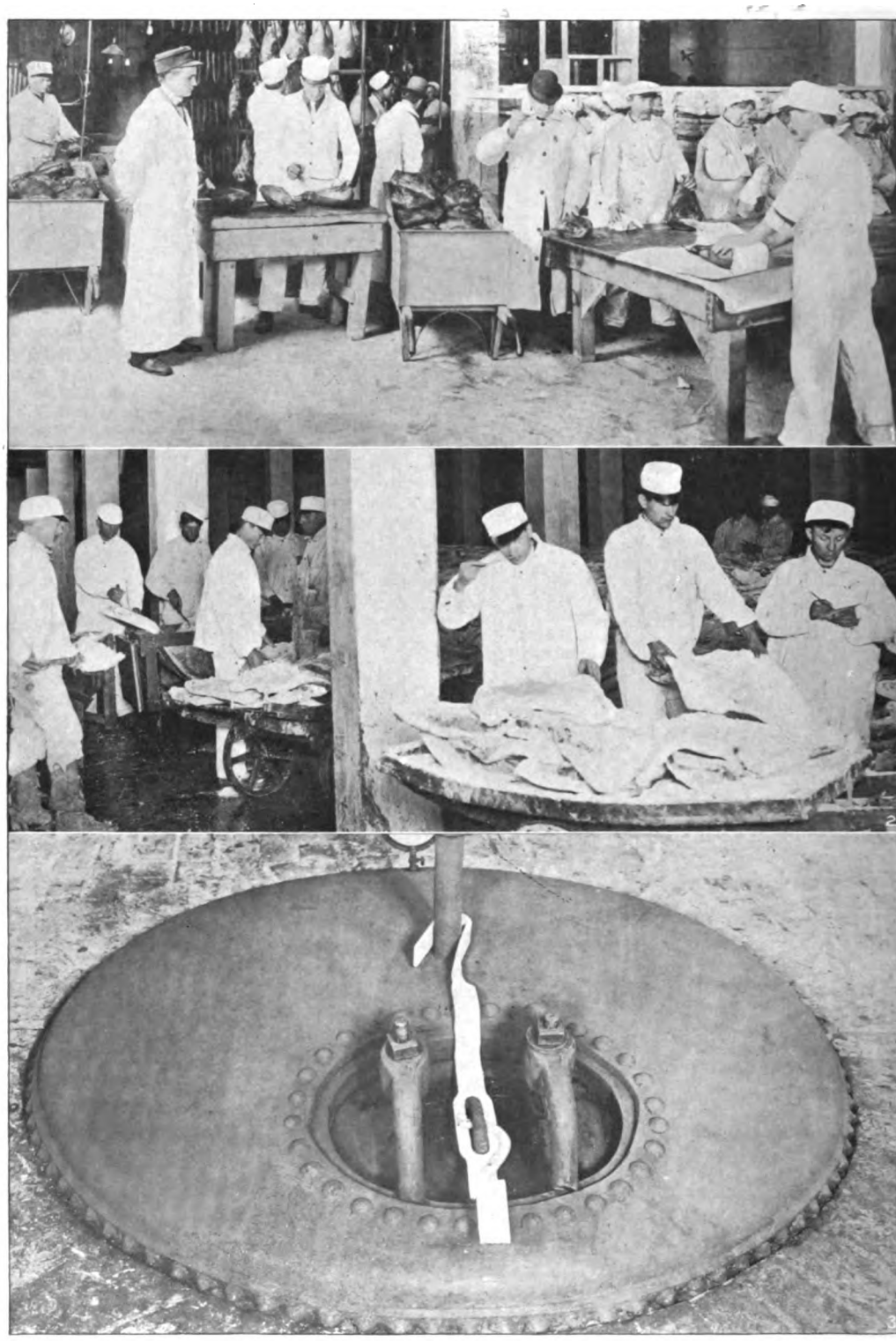
Animals which show symptoms of rabies, tetanus, milk fever or railroad sickness, and hogs which are plainly sick with hog cholera,

INSPECTION OF MEAT



1 Ante-Mortem Inspection of Sheep 2 Post-Mortem Inspection of Cattle 3 Post-Mortem Inspection of Swine

INSPECTION OF MEAT



1 Products Inspection

2 Dry Salt Curing Cellar

3 Sealed Rendering Tank

are condemned on the ante-mortem inspection. Such animals are marked by means of a serially numbered "U. S. Condemned" metal tag affixed to the ear. Animals so tagged may not be taken into the slaughter-room, but must be destroyed and disposed of as required for condemned carcasses to prevent their use for food. Animals found dead or in a dying condition on the premises are condemned and disposed of in the same manner.

Post-Mortem Inspection.— The post-mortem inspection is made at the time of slaughter and includes a careful examination of the carcass and all its parts. Where the number of animals dressed per hour does not exceed a certain general limit, one inspector, constantly present, performs all the inspections. Where the number of inspections per hour exceeds certain general limits, the inspectors are increased accordingly and the work so arranged and coordinated that each inspector gives his entire attention to some particular part of it. Thus the work is in a sense specialized with the result that a high individual and collective proficiency is attained and efficient inspection assured regardless of the rate of slaughter. An important requirement in the conduct of this inspection is that the identity of the carcass and of each of its severed parts be carefully maintained until the inspection is completed, so that if there is a disease in any one organ or part, all the other parts and the carcass may be brought together for additional examination. Facilities for maintaining such identity are provided in the slaughter departments.

The different steps of the post-mortem inspection are: Head inspection, viscera inspection, carcass inspection, final inspection, disposition and marking. In cattle heads the different pairs of lymphatic glands are cut into and examined, particularly for tuberculosis. The tongue is also examined. The presence in the flesh of cattle of a certain cyst capable of producing tapeworm in man can usually be determined by examining the inner and outer cheek muscles. A careful survey is made of the head as a whole for actinomycosis, deformities, etc. In the heads of swine certain lymphatic glands, which are favorite seats of tuberculosis, are incised and examined.

In the inspection of viscera, the several organs as they are removed from the carcass are placed before the inspector, on a table, in pans or other suitable metal receptacles for examination. Facilities for promptly cleansing such equipment in the event of contamination through the contact of diseased viscera are at hand. The various organs and parts are carefully viewed and certain of them cut into while others are subjected to manual as well as visual examination.

The carcass inspection embraces a careful viewing of all surfaces and parts of the carcass, with particular attention given to the condition of the serous membranes of the thoracic and abdominal cavities. Further, certain parts which more frequently than others are seats of disease are subjected to a manual as well as a visual examination. The head, viscera and carcass examinations together constitute the regular post-mortem inspection. The animals found to be free from disease or any doubtful condition are marked "Inspected and Passed," while those in which any disease or doubtful condition is found are retained for the final inspection, which takes place in a special room, where another inspector with special facilities at his command subjects them to a searching examination. Since the animals held for final inspection are tagged or retained for cause, only veterinary inspectors who have become skilled through training and experience in the work are detailed to make such examinations and to determine the final dispositions.

As soon as the several examinations have been made and the dispositions determined, there remain two important acts to complete the post-mortem inspection. They are the marking of each carcass to show plainly to every beholder the disposition made of it and to see that those carcasses and parts which are condemned are disposed of as required by the regulations to prevent the sale or use of the same as human food. In regard to the disposal of condemned articles it is required that every condemned carcass, part of carcass, meat or product be plainly marked to show that it is condemned, and that parts or products too small to be so marked be placed in appropriately marked containers. All condemned articles remain in the custody of an inspector from the time they are condemned until properly disposed of, and if not disposed of on the day they are condemned they are locked in the "U. S. Condemned" compartments, the locks of which are selected and supplied by the department and the keys of which remain in the custody of the inspector. The required destruction or denaturing of the condemned articles must be done in the presence of an inspector, who renders a report on the transaction. The usual method is to convert condemned parts into grease and fertilizer by rendering in a steam-pressure tank.

Inspection of Products.— Because meat or other edible portion of an animal which was entirely sound at the time of slaughter may become unsound or contaminated through improper care or handling, and because healthful products may be made unwholesome through adulteration or the addition of deleterious ingredients, and for the purpose of protecting the purchaser against false and misleading labels, a proper measure of control of the various operations of processing, preparing and labeling meats and products becomes necessary and such control is exercised by the Federal Inspection Service. All meats and products, therefore, notwithstanding that they were previously inspected and passed, are reinspected as often as may be necessary to ascertain whether they remain sound and wholesome. The materials added to products are examined to see that the regulations relating to prohibited ingredients are absorbed and that the requirements as to correctness of labeling are complied with. Samples of the different kinds of products are taken and referred to the meat inspection laboratories for chemical or other technical examination. If upon reinspection of an article it is found to have become unfit for food from any cause, the original inspection mark or label thereon is removed or defaced and the article condemned.

Imported Meats and Meat Food Products. — The regulations governing the admission of meat and meat food products from foreign countries require that every importation shall

be accompanied by a certificate signed by an official of the national government of the country of origin; stating that the animals from which the meat or meat food product was derived received an ante-mortem and a post-mortem veterinary inspection, and that at the time of slaughter the meats and products were sound, healthful, wholesome and otherwise fit for human food. Further, that they had not been treated with and contain no ingredient prohibited by the regulations of the United States Department of Agriculture. Meat or meat food product not accompanied by the required certificate is refused entry, and that from a country which does not maintain a system of meat inspection satisfactory to the Secretary of Agriculture is also refused.

Upon arrival every consignment of imported meat or product is checked with the foreign inspection certificate and is subjected to a thorough physical examination, and in most cases samples thereof undergo a laboratory examination. The meat or product is then admitted, refused entry or condemned according to the findings.

Statistics.— The Federal system of meat inspection reaches about 60 per cent of the animals slaughtered in the United States and all imported meats. This leaves approximately 40 per cent of the domestic meat supply outside of Federal control. Much of the latter, it is known, receives no adequate inspection. The number of establishments at which inspection is regularly maintained varies somewhat; however, for several years it has approximated 850. The total of cattle, sheep, swine and goats given both the ante-mortem and post-mortem inspections is in excess of an average of 58,500,000 per year. The average number of whole carcasses of such animals condemned during that period was more than 262,000 per year, while the number of parts of carcasses condemned per year was very much greater. The records of the inspection and reinspections of meats and products subsequent to the slaughter inspection show totals running into billions of pounds annually, while the amount condemned on reinspection on account of having become tainted, rancid or otherwise unfit for human food approximates 18,000,000 pounds per year. In 1915 Congress appropriated $3,375,000 for meat inspection. Thus the cost was less than six cents for each of the 58,500,000 animals slaughtered. Consult Ditewig, George, 'The Meat-Inspection Service of the United States Department of Agriculture' (in the 'Yearbook for 1916' of the Department, Washington 1917).

MEAT, Market Classes and Grades.— The kinds of meat considered in this article are beef, veal, pork, mutton and lamb. Each kind is classified according to certain general distinctions, such as the sex of the carcass or the part from which the cut is taken. The classes, in turn, are graded with respect to quality, covering, weight or other factors which determine the value of the individual cut or carcass.

Beef.

Beef products are marketed either chilled, frozen or cured. Fresh chilled and fresh frozen beef include the carcasses, quarters and the various commercial cuts of beef. Cured beef includes pickled or corned beef, dried or smoked beef and canned beef. About one-half of the fresh beef sold on wholesale markets consists of carcass beef. (The carcass is split into halves or sides; each side in turn is divided into fore and hind quarters). The rest is sold in the form of commercial cuts such as ribs, loins, rounds, chucks, plates, briskets, flanks, shanks and suet. "Block" beef refers to all side beef which is sufficiently thick fleshed and fat to be sold readily over the butcher's block. "Cutters" are the carcasses of thinly fleshed or poorly finished cattle from which only certain commercial cuts such as loins and ribs are suitable for block purposes, the other portions being adapted only to conversion into boneless cuts and cured meat products. "Canners" are those carcasses of beef no portion of which is suitable for block purposes. Such carcasses generally are divided into smaller cuts, such as boneless fresh meats, sausage trimmings, canned and cured beef products.

Classes and Grades of Carcass Beef.— The classes of carcass beef are steers, heifers, cows, bulls and stags. This classification is based not merely upon difference in sex, but also upon the general uses to which the different classes are adapted. Steer carcasses are identified by the cod fat and generally by their full, fleshy rounds and loins, heavier, coarser bones and short, thick necks as compared with cows. They show more quality and finish and are sold as carcass beef more extensively than any other class. The grades are prime, choice, good, medium and common. Heifer carcasses are distinguished from steers by the udder which also should show no evidence of lactation or a development of the sinuses usual in the udders of cows. As a rule they have smaller bones, slightly more angular rumps, less development of lean flesh and are of an average lighter weight than steers. The grades are prime, choice, good, medium and common. The angular form, long neck, hard white bones, more cavernous interior and lack of thickness of the flesh of the majority of cow carcasses make them easy to distinguish from other classes of beef. The vertebræ do not split as smoothly as in heifers or young steers. The flesh is seldom as well marbled by fat deposits between the muscle structure as in heifer or steer carcasses. A large percentage of the carcasses of this class are cutters and canners with a correspondingly smaller proportion suitable for "block beef." The grades are choice, good, medium, common and canners.

Dressed bulls are easily recognized by the short and thickly muscled, prominent neck, heavy shoulders, thick rounds, dark and coarse-grained flesh and the absence of cod fat. Rough conformation and hard bones are also common characteristics of bull sides. Many stags approach steers in form, quality and finish, while others are difficult to distinguish from bulls. "Yearlings" are carcasses of young steers and heifers with sufficient quality and finish to be used as block beef. "Butcher" cattle, as the term is applied to carcass beef, are those which are suited to the cheaper "butcher shop" trade. They include the medium and common grades of all classes of beef cattles. "Kosher" cattle are dressed beeves that have been slaughtered, inspected, cleansed and labeled in accordance with Jewish rites; "Kosher" being the Hebrew word for "clean."

They include all classes and grades of beef cattle. "Distillers" are steers, bulls and stags that have been fed on distillery wastes and have soft, "puffy," "washy" flesh together with the "high color" that is characteristic of cattle fattened on such feed.

Beef Cuts.— Beef cuts are sold both as "straight cuts" and as subdivisions thereof. The method of dividing carcasses into cuts differs, in the various cities and sections of the country. The straight cuts handled in Chicago markets are loins, ribs, rounds, chucks, plates, flanks and shanks. The standard grades of straight cuts are No. 1, No. 2 and No. 3, according to their weight, quality and thickness. Cuts that are too deficient in thickness and quality to be used on the butcher's block, and which consequently are made into boneless cuts, cured beef products, sausage, etc., are called "strippers."

Cured Beef Products.— The plates, flanks and rumps of all grades of cattle are, at times, used in making cured beef, and in the lower grades of beef the rounds and chucks are quite commonly cut up and cured before marketing. Barreled or corned beef is packed in brine. The standard barreled beef products are extra India mess beef, extra plate or extra family beef, regular plate or family beef, packet beef, common plate beef, rolled boneless beef, prime mess beef, extra mess beef, rump butt beef, mess chuck beef, beef hams and Scotch buttocks. Smoked or dried beef consists almost entirely of beef hams, made from the rounds which, after curing in sweet pickle, are dried and smoked. Canned beef is hermetically sealed in tins or glass jars, usually after curing and processing. It consists principally of chipped beef, beef loaf, corned beef and roast beef. Roast beef is not cured but is cooked and processed in about the same manner as corned beef products.

Factors in Grading Beef.— The grade to which a carcass, side or quarter belongs depends upon its form, thickness, finish, quality, soundness and weight. The factors that determine the grade of a wholesale cut of beef are its thickness, covering, quality and weight. By "form" is meant the shape or "build" of the side, its general outlines and the proportions of its different parts. Thickness of a carcass or cut refers to the amount and depth of lean flesh it carries. It is a factor of self-evident importance in selecting wholesale cuts. "Finish" refers to the amount and distribution of fat with reference to the covering of the carcass or cut, to the fat deposits around the muscle structure and to the quality of the flesh in so far as it depends upon the degree of fatness. Quality in beef is so closely associated with form, thickness and finish that the term often is used loosely to cover all three points. It refers more particularly to size, color and softness of bone, smoothness and grain of flesh, color and general appearance of the carcass or cut and an absence of coarseness in general. Soundness refers to freedom from disease and bruises, and from any other conditions which injure the appearance or keeping qualities of the meat. Weight is of importance in grading beef to the extent that the heavier carcasses generally are better in form, thickness, finish and quality than lighter ones; but weight has lost much of its former significance as a grade factor owing to the development of earlier maturing beef types, the increasing practice of finishing and marketing beef cattle as yearlings and two-year olds, and the growing tendency of the consumer to prefer steaks, roasts and other cuts from relatively lighter weight carcasses of good quality and finish.

Veal.

Calf carcasses weighing less than 300 pounds with comparatively light-colored, fine grained flesh are classed as veal, and the trade is essentially a fresh meat trade. In dressing calves the skin generally is left on in order to preserve the color and moisture of the flesh. The carcasses from heavy or yearling calves are skinned and split and are known as "split veal."

Carcass Veal.— The grade and value of a calf carcass depend upon its form, quality, finish and weight. The weights of dressed veal vary greatly with the season, being lightest in April and May and gradually becoming heavier until the next annual veal season. The grades of carcass veal, the extreme weights and the usual weights of each grade are as follows:

Grades	Extreme Weights	Weight of Bulk
Choice	80–120 lbs.	90–100 lbs.
Good	70–130 "	75–95 "
Medium	60–160 "	65–80 "
Light and Common	40–75 "	50–65 "
Heavy and Split	150–350 "	160–200 "

Veal Cuts.— Only 10 to 20 per cent of the supply of dressed calves are cut up in the wholesale trade, and this is done largely to supply a few retail markets with choice cuts and to take care of the Kosher trade which uses only the forequarters. The cuts usually made are saddles and racks, both of which grade choice, good, medium and common.

Pork Products.

Hog products may be described under two heads: dressed hogs and pork cuts.

Dressed Hogs.— The classification of hog carcasses is based on the uses to which they are adapted, or the products into which they may be converted. Smooth heavy or heavy loin hogs are prime smooth hogs, either barrows or good, clear (not seedy) sows, weighing 240 to 400 pounds dressed. Butcher or light loin hogs are composed of barrows and smooth, clear sows, weighing from 200 to 220 pounds dressed. Packing hogs include mixed hogs of all weights which are too coarse in quality, rough in shape or soft and uneven in finish to be suitable primarily for fresh pork products or smoked meats, and which therefore are packed principally in such forms as barreled and dry-salt pork. The grading of this class of hogs is based on weight, the grades being heavy, medium and light. Bacon hogs are those which are suitable primarily for sugar-cured breakfast bacon and "English" meats. The hams from this class of hogs are preferred by the trade to the heavier varieties. The grades are choice, good and common and are determined by the degree of quality and finish. "Shippers" are similar to butcher hogs in shape and quality but are lighter in weight and generally are not as highly finished, having only a moderate covering of fat and a comparatively small amount of leaf fat. Pigs are carcasses of light, young swine that are comparatively lean and light-colored in

flesh, with thin, soft skin, soft, red bones, weighing from 20 to 100 pounds.

Pork Cuts.— The various cuts made from dressed hogs may be divided into the following general classes: hams, sides, bellies, backs, loins, shoulders, butts, plates and miscellaneous. These products are referred to according to the manner in which they are handled, prepared or packed; viz., fresh pork cuts, dry-salt and bacon meats, barreled or plain-pickled pork, sweet-pickled meats, smoked meats, "English" meats and boiled meats. Fresh pork cuts are sold either chilled or frozen. The bulk of the uncured product is disposed of within a few days after slaughter, during which time it is chilled at temperatures slightly above the freezing point. Fresh pork cuts are taken more or less from all classes of hogs, but light loin hogs are used more extensively for fresh pork than any other class. The loin is the leading fresh pork cut. Tenderloins and spareribs also are used primarily as fresh cuts. Shoulders, plain and skinned, shoulder butts, hams, bellies, fat backs and raw leaf fat are sold fresh to a small extent.

Dry salt meats are domestic cuts made from heavy, fat packing and loin hogs, cured and shipped in coarse salt. They generally are pumped with a strong brine to hasten the cure and make it more certain. The cuts which are sold in this form are heavy sides, bellies, shoulders, fat backs, plates and jowls. Barreled or plain pickled pork is packed in plain salt brine in tight barrels, and is made largely from sides of packing and heavy loin hogs. It consists principally of mess, fat back and belly pork of various grades. A much smaller proportion of the pork supply is barreled than formerly. Sweet-pickled meats are cured in brine, to which sugar or molasses has been added to aid in curing, to improve the taste and to give the product a better color effect when smoked. Most of these products are smoked before they reach the consumer. The cuts which are quoted as sweet-pickled meats are hams, picnics, New York style and skinned shoulders, boneless butts and light bellies. This class of meats is cut principally from butcher hogs and from medium and light packing hogs. Hams and picnics from all classes of hogs generally are sweet-pickled. Smoked meats are pork products which have been cured in brine, sweet pickle or dry salt before smoking. "English" meats is a term applied to cuts that are dry-cured in English salt and saltpetre; borax being added when required by the foreign purchaser. They are primarily adapted to English trade, being given a milder cure than domestic meats. The leading cuts of this class are "English" bacon sides, long-cut hams, clear backs and bellies and square-cut shoulders. Boiled and cooked meats consist of boneless hams, picnic shoulders and loins which have been cured in sweet pickle and cooked by steam or in water. They sometimes are given a light smoke.

Hams are of two general kinds, short-cut and long-cut. The former are made from comparatively fat, plump hams, trimmed short and round at the butt, with the foot cut off generally above the hock joint. Long-cut hams are lean, long hams, with the butt left full and the foot taken off at the first joint below the hook. Sides include various grades and cuts of short ribs, short clears and "English" bacon sides. Short rib sides include regular short ribs, jobbing or rough short ribs, hard short ribs, extra short ribs or "extra ribs," and square cut or "English" short ribs. Short clear sides include regular short clear sides and extra short clear sides or "extra clears." "English" bacon sides, comprising both the side and shoulder, and in one instance the ham also, include Wiltshire, Cumberland, Dublin, long rib, long clear, Yorkshire and Staffordshire sides.

Bellies include dry-salt, sweet-pickle, breakfast bacon and English bellies. Backs include the short rib backs, short clear backs, short fat backs and long fat backs. Loins consisting of the back with the fat trimmed off are sold either as regular pork loins or as loin rolls.

The standard grades of shoulders are rough, regular, picnic, New York style, skinned, square, New Orleans style and boneless rolled shoulders. Shoulder butts are cut from muscular parts of the ends of tops of the shoulders. Jowl butts are made from the jowl (neck and face). The various grades of shoulder butts are boneless Boston style, Milwaukee style, Buffalo style, New York style, picnic, dry-salt and square-cut butts. Plates are made from the heavy fat which covers the ends or tops of the shoulders. They are known to the trade as regular plates and clear plates. The so-called back plates are made from fat backs.

Miscellaneous Cuts.— The miscellaneous cuts of pork may be grouped as mess pork, belly pork, shoulder pork, spareribs and trimmings. Mess pork includes regular mess pork, light mess pork, prime mess pork, extra clear pork and loin clear pork. Belly pork includes regular belly pork, brisket pork and rib and lean belly pork. Back pork includes regular back pork (short cut mess or family back pork), clear back pork, fat back and short cut clear pork and ham butt pork (loin end or rump pork).

Shoulder pork consists of extra prime pork and Boston style butt pork. Bean pork or clear-butt pork is made from the jowl. Spareribs are termed "full-sheet," "half-sheet" and "backbone" spare ribs. Neck bones including the shoulder ribs come within this general class. Trimmings are of two grades: special lean or "A" and regular or "B" grade. The standard grades of lard are kettle rendered, neutral, prime steam, refined and compound lard. They differ as to the kinds of fats from which they are made, methods of rendering, color, flavor and grain. Lard compounds are composed of a mixture of pork fats with other animal or vegetable fats or oils. Lard substitutes or vegetable shortening contain no pork fats or oils, being composed wholly of vegetable fats, or of vegetable fats with beef fats added.

Mutton and Lamb.

Mutton and lamb are sold almost entirely in a fresh or frozen state. The bulk of supplies, except those frozen, are disposed of within a week or 10 days after slaughter. Approximately two-thirds to three-fourths of the wholesale supply of mutton and lamb consists of lamb.

Classes and Grades of Carcass Mutton and Lamb.— The classes of dressed sheep and lamb are wethers, ewes, bucks, yearlings and lambs. This classification is based on differences

in sex and degree of maturity. The grades of carcasses in the different classes are designated by the terms choice, good, medium, common and culls or canners. The grade and value of a lamb or mutton carcass depend chiefly upon its form, quality, covering and weight. The method of grading is the same in principle as the grading of beef.

Wether carcasses are distinguished from ewes by the cod fat; from bucks by their smaller necks and shoulders and finer quality, and from yearlings and wether lambs by "round" joints on the fore-legs. The "bag" (udder) and a comparatively large "bung" (pelvic cavity) are characteristic of ewe carcasses. They also are distinguished from wethers as a rule by their more angular forms, longer necks, smaller bones and less abundant flesh, especially over the loin, back and ribs. Bucks constitute only a very small percentage of the dressed mutton supply. They may be identified by their thick, heavy necks, shoulders and briskets, large bones, coarse, dark colored flesh and fat and thick, oily "skin" or "fell." Yearlings may be defined as carcasses that show by their general development and by the "break-joint" that they are not mature sheep, but are too old and generally too heavy to be classed as lambs. Carcasses of sheep that are more immature than yearlings are classed as lambs. Like yearlings, they have the fore-legs removed at the "break-joint" or "lamb-joint," which has a tooth-shaped surface.

Mutton Cuts.—About one-half the supply of dressed wethers, ewes and yearlings in large wholesale markets is sold as mutton cuts. The two major cuts are known as racks or fores and saddles or hinds. The racks are made into stews and short racks. The short rack includes two-fifths and the stew three-fifths the weight of the rack. The cuts derived from the saddle are the leg and the loin.

The grades of mutton cuts are choice, good, medium and common. Cuts of these grades correspond in shape, quality, covering and relative weight to the same grades of carcass mutton.

Lamb Cuts.—Lambs are more largely sold in the carcass than sheep. It is estimated that one-fourth to one-third of the wholesale lamb trade consists of cuts. The methods of cutting and the proportions of the various cuts are identical with those of mutton. The grading of lamb cuts also is similar in general to that of mutton cuts.

Retail Cuts of Meat.

Retail cuts of meat are classified according to several different standards. Some are satisfied to group them simply as tender and tough meats. Others grade the different cuts as first, second, third and fourth quality, according to their degree of general excellence. Likewise, taking the market price as a basis, the classes may be designated as high, medium or low priced, as the case may be. The location of the cuts in the carcass is another means of fixing their names in mind, learning them in consecutive order from neck to hind shank. Aside from the quality consideration involved in selecting retail cuts of meats, the selections are influenced chiefly by the following:

1. The cuts which are best suited to one's cooking facilities.
2. The time and trouble which one desires to take in preparing the meats for the table.
3. The amount of meat required for the meal or meals in question.

Classifying retail cuts according to the methods of preparation, we have the following general division:

1. Frying or sauteing.
2. Roasting.
3. Boiling.
4. Stewing.
5. Soups and broth.

The purpose for which each retail cut from beef, veal, lamb and mutton, and pork may be used is indicated below. The number of pounds usually found in such cuts is shown by the figures opposite the cuts named.

	Weight — Pounds
Frying:	
Porterhouse steak	1½ to 3
Club steak	1 to 2
Sirloin steak	2 to 5
Round steak	2 to 5
Top round steak	1½ to 3
Chuck steak	2 to 4
Flank steak	1 to 2
Veal steak	1 to 2
Pork steak	1 to 1½
Mutton chops	½ to 1
Lamb chops	½ to 1
Veal chops	½ to 1
Veal cutlets	½ to 1½
Pork chops	½ to 1
Salt pork	1 to 3
Fancy breakfast bacon	½ to ¾
Medium to fat bacon	½ to ¾
Roasting:	
Prime ribs of beef (first cut)	4 to 12
Prime ribs of beef (last cut)	4 to 12
Shoulder block roast	4 to 8
Chuck rib roast	4 to 10
Beef rump	4 to 12
Beef tenderloin (fillet)	2 to 6
Leg of mutton	6 to 9
Loin of mutton	3 to 6
Shoulder of mutton	3 to 6
Leg of lamb	3½ to 6
Loin of lamb	2 to 4
Shoulder of lamb	3 to 4
Crown lamb roast	3½ to 6
Hindquarter (spring lamb)	5 to 8
Forequarter (spring lamb)	5 to 8
Pork loin	2 to 8
Leg of pork	3 to 12
Ham (smoked)	3 to 12
Pork tenderloin	½ to ¾
Pork shoulder	2 to 5
Spare ribs	½ to 1
Veal loin	3 to 6
Veal leg (fillet)	3 to 12
Veal shoulder	3 to 8
Boiling:	
Beef horseshoe piece (end round)	4 to 8
Beef shoulder clod	3 to 6
Rib end of beef	2 to 6
Cross-ribs of beef	2 to 5
Beef brisket	3 to 8
Corned beef, rump, flank, plate or brisket	2 to 8
Beef tongue, fresh	3 to 5
Beef tongue, smoked	2 to 3
Leg of mutton	6 to 9
Shoulder of mutton	3 to 6
Shoulder of lamb	3 to 4
Leg of pork	3 to 12
Ham, smoked	3 to 12
Pork, shoulder, fresh	3 to 8
Pork hocks	1½ to 2½
Back-bones and neck bones	2 to 8
Stewing:	
Beef plate	3 to 6
Beef flank	2 to 6
Drop tenderloin	1 to 2
Beef skirts	1 to 2
Beef neck	1 to 3
Beef skin	2 to 5
Breast of mutton	2 to 4
Breast of lamb	1 to 2½
Veal breast	2 to 5
Veal neck	1 to 2

Soup and broth:	Weight—Pounds
Shin soup bones	1 to 4
Hind shank soup bones	1 to 5
Knuckle soup bones	3 to 7
Ox tail	1 to 2
Beef neck	1 to 3
Beef shoulder clod	1 to 2
Beef round	1 to 2
Mutton shoulder	1 to 2
Mutton neck	1 to 2
Mutton shanks	1 to 1½

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MEAT EXTRACT, or juice of meat, has become since its introduction by Liebig (q.v.), a subject of great importance in medicine, dietetics and commerce. The chemical constituents of meat juice are not clearly established, although creatine, sarcine and inosinic acid are among the substances intelligently investigated. Phosphoric and hydrochloric acids and inorganic salts, with some coagulable ingredients are among the constituents. Beef tea while of value does not furnish complete food either for sickness or health. Other preparations under this name are now on the market. Some are merely the juice of meat pressed out or dried pulverized meat; others are the so-called predigested foods. In the true extract of meat fats and albumens are absent; therefore, while of use as a stimulant, such a preparation is not a true food and cannot take the place of meat in this respect.

MEAT INSPECTION ACTS. See PURE FOOD ACTS.

MEAT-PACKING. Meat-packing may appropriately be considered under three heads, namely, preparation and disposal of fresh (unsalted) meats; curing and preservation of meats by salting, smoking and the like, as is usually practised with hog hams, bacon, etc., and preservation of meats by hermetically sealing in tin cans, glass jars, etc., including the final sterilization necessary to complete the process.

Fresh Meats.—The preparation and disposal of fresh meats is perhaps the most important branch of the packing industry and in its development is the newest. Fresh meat has been, of course, an article of commerce from the earliest times; but it is only within recent years that the art of refrigeration has been perfected to an extent enabling fresh meat to be shipped thousands of miles and its condition and quality so conserved that it is more desirable and palatable after arrival at destination than when first slaughtered. Fresh beef, particularly, is much more juicy and tender if well refrigerated and kept two weeks or more after slaughter. Fresh meats will keep best if held in a temperature slightly above the freezing point, but in practice a temperature of 35° F. gives good results, except for long shipments such as from United States ports to Europe, in which cases approximately the freezing point should be maintained; and it may here be observed that lean meat freezes at about 1½° lower temperature than water.

Freezing is slightly injurious to the palatable quality of fresh meat, but by freezing hard and holding at a temperature of 10° F. it may be kept without taint for many months. When beeves are in good supply and cheap, the choice cuts, such as ribs and loins, are frozen and held in large quantities until the winter and spring season, when they usually meet with a more favorable market. Fresh pork and mutton are sometimes frozen and carried from season of surplus to season of scarcity, but the volume of this trade in the United States is not great, comparatively. This carrying from the season of over-supply to the season of under-supply by means of freezing has a doubly beneficial effect on the market, increasing the demand for live stock during time of glut, and increasing the supply during the time of scarcity.

The dressed carcasses are, immediately after slaughter, still being suspended from the trolley hooks on which the latter part of the dressing operation is done, run into refrigerated rooms and chilled, usually for two days. The cattle carcasses, and usually the hog carcasses, are split through the back bone into "sides." After chilling, the sides are cut, the beef usually into quarters and the pork into smaller pieces. The quarters of beef are shipped hanging on hooks in refrigerator cars, and the smaller pieces intended for sale fresh are usually boxed and shipped also in refrigerator cars. Mutton and lamb are shipped in the same way, usually in whole carcasses. The refrigerator cars used depend upon ice for their temperatures, and the most successful cars use the ice crushed and with from 6 to 12 per cent of rock salt intermingled.

The development of the fresh meat branch of the packing industry received its first important impulse from George H. Hammond, who, in the summer of 1869, began at Hammond, Ind. (a suburb of Chicago), the business of shipping fresh beef in refrigerator cars to Boston. The first year the business was not successful, but it was courageously continued, the difficulties were gradually overcome, and the second year found it more satisfactory, and the volume amounted to about 600 quarters per week. During the following two years this volume was doubled and it continued to grow moderately until, in 1877, Gustavus F. Swift established at the Union Stock Yards, Chicago, a similar business. Under the stimulus of this competition the trade increased rapidly, consignments were made to other cities in New England and New York, other houses entered the trade, and by 1885 it became apparent that this new method of slaughtering cattle near their native pastures and shipping the fresh meat was destined to supersede, largely, the older method of shipping them on

the hoof and slaughtering near the place of consumption. To-day a large portion of the fresh beef used in the principal cities east of Chicago, and out of the cattle raising belt, arrives at destination in refrigerator cars. What is true of fresh beef is true also of fresh mutton and pork.

In the early days of the fresh meat branch of the packing industry, it became apparent that new methods of handling and disposal at destination were necessary; obviously, *fresh* meat could not be received in carloads and distributed to the retail dealer, through an ordinary, unrefrigerated warehouse, as had been the custom with cured meats. To meet the necessities of the case, refrigerated rooms were built, with systems of overhead tracking, on which quarters of beef and carcasses of small stock were stored and handled, suspended from trolley hooks. In connection with these refrigerated rooms, or *beef coolers,* as they came to be known in the trade, there were built suitable shipping rooms, offices, etc. These distributing houses were, as a rule, built adjacent to railroad tracks, enabling the direct discharge of meats from the cars. As the business began to assume some magnitude, it became evident to the packers that great care in the construction, maintenance and operation of these distributing houses was of the utmost importance; it was therefore desirable that a packer own houses for distributing his fresh meat, thus being in position to control, absolutely, conditions of cleanliness and temperature. The earliest fresh-meat packers did not engage in the other branches of meat-packing; but as soon as it became apparent to the older packers, who had previously confined their fresh-meat business to the locality of their packing houses, that the new method of distribution was successful, they began to enter the fresh-meat business aggressively, which in turn forced the pioneers of fresh-meat packing to add the other branches to their business, because a packer having all kinds of meat product to offer to the retailer had an obvious advantage. This diversification caused, in turn, the development of the distributing house, the addition of smoke-houses for smoking hams and bacon, store-rooms for canned meats, lard, etc., until to-day the leading packers own, in the principal cities of the country, their distributing houses, where the retailer may obtain any form of animal food-product, including many by-products. There are more than two thousand such houses scattered throughout the United States. This branch house system of distribution, by its economy and thoroughness, and its adaptability to supply a wide variety suited to all the local needs, has been one of the prime factors in the growth of the meat-packing industry.

The beginning of this branch of the packing industry was coincident with the successful application in a large way of refrigeration to railroad cars. The first cars were, however, comparatively crude, and the modern refrigerator car, as used to-day by practically all of the packing companies, has reached its present state of development by a steady growth of improvements made from time to time. This matter of perfection of the refrigerator car has been one in which there has been great rivalry among the various packers, and to this competition is due the high efficiency of the present refrigerator car for carrying fresh meat. The building, maintenance and care of these refrigerator cars is the field of one of the most important departments in connection with the various packing companies. The cars must not only be kept in first-class running order so as to make them suitable for operating on fast trains, but they must be kept in a high state of cleanliness. The icing of the cars is also a very important feature and has to be done with the utmost care. Before loading, the cars must be iced at least 24 hours in advance, so as to be thoroughly cooled. They are then re-iced at the time of shipment and are re-iced in transit as necessary, depending upon the length of the journey. Immediately after unloading, the car is scrubbed with soap and hot water, all hooks are wiped clean and the car is ventilated so that it will return home in a sweet, clean condition.

Curing and Preservation by Salting, Smoking, etc.— The preservation of meat by salting, smoking, etc., was the first method extensively practised, and the term "packing," now applied to the whole business, formerly had a narrower meaning and was used in connection with this branch exclusively. In fact this was, in the early days, the only branch.

From the earliest times meats have been cured by salting and smoking and in principle there is nothing essentially different in the practice of the modern packing plant from the curing processes used by the packers of earliest days. The business is now conducted on a much larger scale, and with more care as to conditions, particularly as to refrigeration and sterilization, so that meats are now cured with less salt than formerly, or to use the trade expression, *mild cured.*

The two methods of curing with salt are known as "pickling" and "dry salting," and these terms are relatively descriptive. In pickling, the meat, after being cut into hams, shoulders, etc., is submerged in pickle or brine and kept under the surface with weights or other devices, so the salt in the pickle is diffused through the meat. This causes the strength of the pickle to decline and the meat must occasionally be removed, and placed in a fresh hogshead with restrengthened pickle. The usual time of cure varies with the size of the joints or pieces of meat, but ranges usually between 30 and 45 days. The pickle is made of various strengths for various cuts of meats, but is generally 40° to 50° salometer, and for hams, bacon and the finer cuts of meat contains sugar as well as salt and a small percentage of saltpetre. Meats for consumption in the United States are generally cured in sweet pickle.

The process of dry-salting is to pile the joints or cuts of meat closely in layers on the curing floor, first rubbing them thoroughly with salt, and sprinkling salt freely between the layers and on top. The piles are made three or more feet in height, and the meat is left for 10 days, when it is overhauled, rubbed again with salt and repiled; and this overhauling is repeated again in another 10 days. The time necessary for the curing by the dry-salt method is substantially the same as by the pickling method. The dry-salting method is used for most meats for exportation to Great Britain, and the method is frequently spoken of as "English cure," being the standard method in England.

Hams, shoulders, bacon and side meats are, after curing, generally smoked. The process of smoking is also quite old and its origin unknown. The meats are hung in brick houses or compartments in tiers, as closely together as practicable without touching, a slow fire of wood is built beneath, and the meats kept in the resulting smoke for 12 to 48 hours. They are then cooled, wrapped, boxed and made ready for shipment. Hams and bacon, also shoulders, generally have a brand burned in the skin before wrapping. For shipment to hot climates the pieces, after wrapping in paper, are also "canvased," or sewn up in cotton sheeting, and coated with a thick pasty solution of China clay, barytes or the like, and then dried: This forms an air-tight, vermin-proof covering. Hickory and sugar maple are the best woods for smoking.

The preceding paragraphs relating to the curing of meats by salting, smoking, etc., describe the process as applied to meats of the hog. Beef is cured in like manner by pickling and is generally shipped to destination and kept in the pickle until removed for consumption. An exception is "dried beef," being the suitable lean pieces, which, after curing in pickle, are smoked slowly for several days so as to dry them to a firm condition.

Preservation by Hermetically Sealed Cans, etc.— The method of preserving meat by packing in hermetically sealed tin cans and the like was introduced commercially into the United States about the year 1873 at Chicago, Ill., by William Wilson and John Wilson. In the following year Libby, McNeil and Libby also entered this trade, and during succeeding years other houses followed. The business grew rapidly from the beginning, and has reached great magnitude.

The process in brief is as follows: The meat after being trimmed from the bones and cut into small pieces is put into a curing pickle composed of common salt and a little sugar in solution. It is left in this pickle any length of time from a few days to 20 days, depending upon the degree of saltiness desired. It is then taken out of the pickle and cooked in hot water until thoroughly done. After this the gristle is trimmed out, the surplus fat is removed, and the pieces are cut into small and comparatively even sized bits, usually not exceeding four cubic inches. In this condition, and while still hot, it is stuffed by an automatic machine into tin cans which have previously been prepared and thoroughly washed. Each can is then weighed so as to get the correct quantity of meat in it, and is "capped," that is, a small tin disc is soldered over the hole through which the meat is introduced into the can. The further steps of the process embrace the sterilization, or so-called "processing," which consists in heating the cans for a number of hours up to a temperature of 250° to 350° F., depending upon the size of the can and the kind of meat. The object in heating is sterilization, being the same process as is pursued by the housewife in canning fruit, etc. The cans are then washed, cooled, labeled and the exposed surfaces are coated with a varnish to prevent rust. They are then ready to be packed and shipped to all parts of the world, and will keep for years without deterioration.

By-products.— The business of meat packing as practised in Chicago and the other large packing centres of the United States involves not alone meat preserving, but the entire range of slaughtering, preparation of the fleshy and other edible parts, and preparation of the by-products, such as hides, hoofs, horns, bones, hair, fats, intestines, blood and viscera. In many of the most prominent establishments these by-products are manufactured into glue, buttons, combs, curled hair, soap, candles, oils, glycerin, etc. All the modern establishments manufacture the blood and residual solids from their fat rendering apparatus into fertilizers, in some cases the blood-albumen being first separated and dried independently.

The accompanying diagram will illustrate graphically the disposition usually made of the different parts of beef cattle.

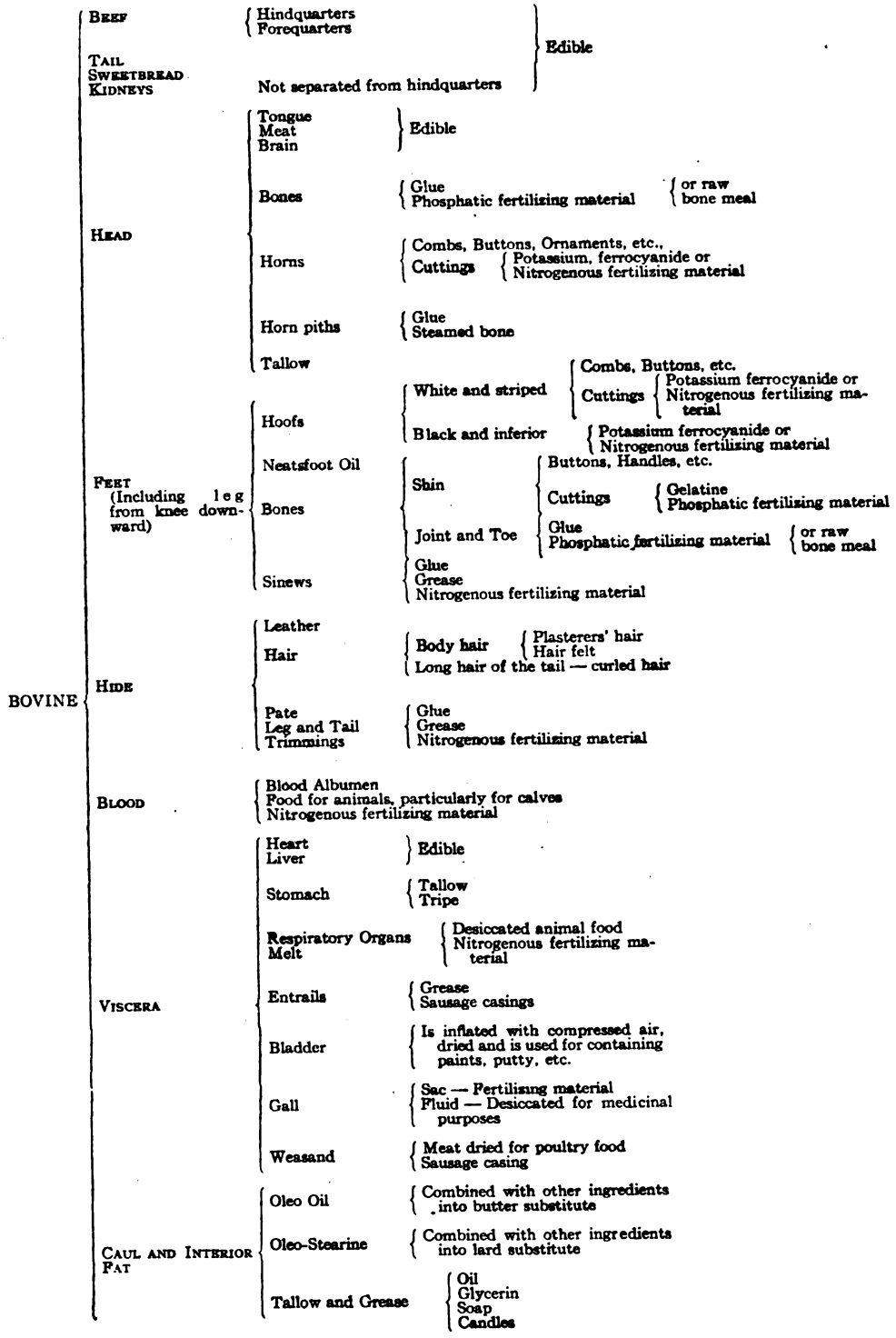
Corresponding parts of other animals are put to similar uses. The stomachs of hogs are utilized for pepsin manufacture. Some of the glands of hogs, sheep and cattle, notably the thyroid and pancreatic, are used in the production of pharmaceutical preparations. Sheep skins first have the wool pulled from them and are then utilized for leather, the cuttings being made into glue. Hog hair and bristles are made into curled hair and brushes. Curled hair is sold for mattress making. All scraps and parts, not put to some other important use, are cooked, desiccated and used in many valuable products and as fertilizing material, the chief property of which is nitrogen.

General.— By the careful study of economy in utilization of by-products large values are now derived from parts formerly wasted. Today there is practically nothing wasted. This close study of economy in saving everything enables the packing business to be done on an unprecedently small margin of profit. For a series of years, including 1915, the fiscal reports, made by some of the largest and most successful packing corporations to their stockholders, show that their profits ranged from 2 to 2½ per cent of their distributive sales.

It must occur to all thoughtful persons that in a business of such large volume the securing of steady and sufficient supplies of fat animals is of prime importance, and the query naturally comes as to how this is done. Almost the entire supply of live stock is purchased from day to day, as needed by the various packing companies, at central markets in the large cities, such as the Union Stock Yards of Chicago, Kansas City Stock Yards of Kansas City, National Stock Yards of East Saint Louis, South Omaha, Neb., South Saint Joseph, Mo., South Saint Paul, Minn., National Stock Yards, Ill., Fort Worth, Tex., Sioux City, Iowa, Oklahoma City, Okla., Denver, Colo., Milwaukee, Wis. These stock yards are equipped to receive live stock in train loads — unload, pen, feed, water, and otherwise care for the comfort and health of the animals.

Live stock raisers most frequently sell their animals at home to a dealer, who, in turn, consigns to a commission salesman at some central market, where the buyers for the various packing companies meet in competition and bid for each lot or carload. The bidding is not by public outcry or auction, but by each buyer independently. There is no public system of grading, but each purchase is made on individual inspection and judgment of the buyer and salesman.

The development of these stock yards has


BOVINE
BEEF
Hindquarters
Forequarters
TAIL
SWEETBREAD
KIDNEYS
Not separated from hindquarters
Edible
HEAD
Tongue
Meat
Brain
Edible
Bones
Glue
Phosphatic fertilizing material
or raw bone meal
Horns
Combs, Buttons, Ornaments, etc.,
Cuttings
Potassium, ferrocyanide or Nitrogenous fertilizing material
Horn piths
Glue
Steamed bone
Tallow
FEET (Including leg from knee downward)
Hoofs
White and striped
Combs, Buttons, etc.
Cuttings
Potassium ferrocyanide or Nitrogenous fertilizing material
Black and inferior
Potassium ferrocyanide or Nitrogenous fertilizing material
Neatsfoot Oil
Bones
Shin
Buttons, Handles, etc.
Cuttings
Gelatine
Phosphatic fertilizing material
Joint and Toe
Glue
Phosphatic fertilizing material
or raw bone meal
Sinews
Glue
Grease
Nitrogenous fertilizing material
HIDE
Leather
Hair
Body hair
Plasterers' hair
Hair felt
Long hair of the tail — curled hair
Pate
Leg and Tail
Trimmings
Glue
Grease
Nitrogenous fertilizing material
BLOOD
Blood Albumen
Food for animals, particularly for calves
Nitrogenous fertilizing material
VISCERA
Heart
Liver
Edible
Stomach
Tallow
Tripe
Respiratory Organs
Melt
Desiccated animal food
Nitrogenous fertilizing material
Entrails
Grease
Sausage casings
Bladder
Is inflated with compressed air, dried and is used for containing paints, putty, etc.
Gall
Sac — Fertilizing material
Fluid — Desiccated for medicinal purposes
Weasand
Meat dried for poultry food
Sausage casing
CAUL AND INTERIOR FAT
Oleo Oil
Combined with other ingredients into butter substitute
Oleo-Stearine
Combined with other ingredients into lard substitute
Tallow and Grease
Oil
Glycerin
Soap
Candles

kept pace with the growth of the packing industry. Indeed, these large central markets for live stock and the packing plants are interdependent and mutually helpful. Together they constitute one of the modern wonders of our commercial development. The benefits to the raiser of live stock, the live stock dealer, the transportation companies, the retail dealer, and to the consumer, of an organized business that affords the producer an every-day cash market for any number of animals, the carrier a reliable and steady freight volume, and the retailer — and through him the consumer — a constant supply of the widest variety of kind and quality of animal food products, can hardly be exaggerated. To appreciate these benefits, let the reader try to imagine a return to the conditions of a generation ago. Within the memory of many still engaged in the business, the farmer had only a local and very uncertain market for his live stock. He could sell in limited numbers, must find his customer by inquiry and frequently had to wait for weeks after his stock was ready and ripe for slaughter. The butcher also depended on local supply, and must needs ride through the countryside and inquire, and frequently felt compelled to buy and use stock of a quality not suited to the demands of his business. He had to drive the animals to his little, unsanitary abattoir, slaughter them himself in the cool hours of the night, and hurry the sale of the fresh meat before incipient decomposition. He was constantly oversupplied or undersupplied, had too much of one grade and too little of another, and so frequently met with losses that his margin of profit must needs be large. The consumer, of course, could fare but ill under these conditions. He might whet his appetite with the thoughts of a juicy porterhouse or a prime rib roast, and find his butcher could furnish only veal or pork chops, and was compelled constantly to choose from a narrow and unattractive variety, and to pay an excessive price. Values were unstable and varied greatly, and producer, dealer and consumer alike suffered.

To-day the modern packing-house, with the central market for live stock which it has built upon one hand, and its system of refrigeration and distribution on the other hand, brings the producer and consumer into such near touch that the one can market his animals in any numbers any day, and the other can buy in any town or village of the country having railroad connections, any desired quantity and quality of so wide a variety of animal food products that his slightest whim or necessity can be satisfied.

This bringing together of the producer and the consumer the modern packer, with the aid of our railroads, stock yards and refrigeration, has accomplished, to the enormous benefit of both; and to-day the actual producer gets a much larger part of the total price paid by the actual consumer than ever before. Investigation by the United States Department of Agriculture showed that the producer received about two-thirds of the price paid by the consumer for meat and by-products.

In this age of engineering and mechanical advancement, the use of machinery has, of course, played a prominent part in the development of the business of meat-packing. The modern packing plant is divided into many departments, so related with reference to each other that the whole, in reality, constitutes a vast machine. The invention and perfection of machines to do the various kinds of work has been given a great deal of attention, and the practical men in connection with the different packing companies have vied with each other so that improvement has followed improvement, in many cases one machine being improved by another before fairly having the newness worn off. To-day, in the most up-to-date packing plants, the vast majority of the operations carried on are done by machines. Such plants are operated entirely by electric power, are lighted by electricity, supplied with water by electric pumps, refrigerated with cold brine circulated by electric pumps, and in some cases even the live animals themselves are hoisted from the ground to the top floor of the slaughter-house by enormous electric elevators, carrying a carload at a time. They are hoisted by means of electrically-driven hoists. Hogs are scalded, scraped, cleaned and delivered to the chill-rooms by machinery, hand work being reduced to less than half what it formerly was. The meats are cut by machinery, also sprinkled and rubbed with salt and packed. Hams are branded by machinery, and are carried by mechanical means to the loading platforms, ready to go into the cars.

In the handling of by-products, various machines do all of the most important work. Fertilizing materials are cooked, pressed, dried, ground, sifted and packed in bags and weighed by machines. Bones are dried, sawn, made into knife handles, buttons, crochet hooks, etc., largely by automatic machinery. Glue is evaporated, jelly sliced, jarred, broken, ground, bolted and packed into barrels by machinery. Soap is cut into bars, stamped, wrapped, packed into boxes, and the boxes nailed and printed by machinery. Soap powder is mixed, ground, sifted, packed into cartons, labeled, pasted and delivered to the boxes by machinery. So on, throughout the various departments, great attention has been given to the introduction and perfection of machines, so that the modern packing plant, volume considered, uses no more than half the hand labor that would have been required 20 years ago to do the same amount and variety of work.

The packing business is one of the largest industries of the country in the value of its output. For 1910 the census report shows 1,641 establishments employing 108,716 persons, with a capital of $383,249,000; value of output $1,370,568,101. This industry returns to the producers of the raw material 87.8 per cent of the total value of the products. Statistics of slaughter for the year 1909, are as follows:

ANIMALS SLAUGHTERED FOR FOOD.

Kind	Total	In slaughtering and meat-packing establishments	In retail slaughter-houses	On farms
Beeves	13,611,422	8,114,860	4,087,922	1,408,640
Calves	6,515,976	2,504,728	2,879,648	1,131,600
Sheep and lambs	14,724,699	12,255,501	1,939,672	529,526
Hogs	53,219,568	33,870,616	3,970,435	15,378,517
Goats and kids	285,553	33,224	133,340	118,989
All other animals	1,597	.....	1,597	.....
Total number	88,358,815	56,778,929	13,012,614	18,567,272

The packing business is notable for furnishing a spot cash market for any quantity of live stock that the producer chooses to send to the market. It is notable for its ability to distribute products of live stock throughout the world, where the demand is greatest, for the enormous volume of business done by the large firms and for their very small margin of profit per cent of sales.

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MEATS AND MEAT PRODUCTION. The discussion of the subject will be confined to a consideration of the properties, use and production of the flesh of cattle, sheep and swine for human food. All animal tissues are made up of dry substance, or solid material, and water. The per cent of water in meats varies from 10 to 78. The two things which appear to have the greatest influence upon the percentage of water in meat are the age and condition, or degree of fatness, of the animal. Other things being equal, the younger the animal the more water its flesh as well as other tissues contains, while the higher the percentage of fat in meat the lower the percentage of water. The extreme variation in the water content of different cuts and varieties of meats is due largely to an extreme variation in fat content. Thus all lean meat consists approximately of 75 per cent of water and 25 per cent of solid material. While the water in meats aids in their digestion and absorption in the alimentary tract, the nutritive value of meats rests largely on the quantity and character of the dry substance or solid material they contain. From 50 to 65 per cent of the fat steer is meat. In other words, the dressed carcass of a steer represents from 50 to 65 per cent of the weight of the live animal. The remainder is made up of by-products, in general, such as hides, fat, offal, etc., less valuable than beef. A physical examination of meats shows them to be made up of muscular tissue or lean meat, fatty tissue or fats, cartilaginous tissue or the gristle, and bone. From the standpoint of the nutritive value of meat, gristle and bone are practically refuse.

Composition.— Chemically, meat is composed of protein, fats, water, ash and carbohydrates, which are the necessary food constituents for the production of energy and repair of the animal body. The amount of carbohydrates is so small as to make it almost a negligible factor. Extractives are also present in meats which are believed to be responsible for meat flavors. While differences in the chemical composition of two cuts of meat are not necessarily an indication of their relative food value, yet the composition of meats in general is important as indicating their place in the diet of man. Lean meat contains from 15 to 21 per cent protein; whole eggs, 12.5 per cent; fresh, whole milk, 3.4, and cheese from 25 to 30 per cent. Fresh vegetables, other than peas and beans, contain 0.5 to 3 per cent protein; fresh peas and beans, 2 to 7 per cent; wheat flour, 10 to 12 per cent; and dry peas and beans, 18 to 25 per cent.

Thus it will be seen that meat contains a relatively high per cent of protein as compared with other staple foods. The mineral matter comprising the ash of meats is made up chiefly of potassium phosphate, with small amounts of magnesium, sodium, calcium, phosphates and chlorides. The percentage of ash in fresh edible meats varies from 0.5 to 1.5 per cent. The organic extractives of meat consist mainly of creatine, certain basic nitrogenous substances including the purine bases, and small amounts of lactic acid, glycogen or animal starch and glucose in traces. Glycogen and glucose are the only carbohydrates in meat and occur normally in very small quantities. The percentage of organic extractives in meat varies widely with the kind of meat and the location of the cut, from 0.7 to 2 or 3 per cent.

Dietetic Value.— Meat is a staple food in the American dietary, chiefly as a source of protein and fat. In the average American dietary, 28 per cent of the protein and 58 per cent of the fat is represented by the consumption of meat from cattle, sheep and swine. Protein is essential for the growth and repair of body tissue, and while the actual bodily requirement for protein may be relatively small, it seems probable that a fairly liberal protein intake is essential for optimum conditions of health and vigor. Meat is an especially satisfactory source of protein in the diet, first, because it is so readily and completely digestible as compared with the vegetable proteins, and, second, because it is better adapted to the body's requirements and thus possesses a higher physiological value. Illustrative of the latter point, in a recent experiment on a human subject it was shown that the following minimal amounts of the various proteins indicated were required to cover the protein requirements of the body and to protect body protein from loss:

Meat protein	.....	30 grams	per day.
Milk "	.....	31 "	"
Rice "	.....	34 "	"
Potato "	.....	38 "	"
Bean "	.....	54 "	"
Bread "	.....	76 "	"
Corn "	.....	102 "	"

The value of meat as a food is also enhanced by its content of organic extractives. These substances are among the water-soluble constituents of meat and give to meat its characteristic flavor. Thus, it may be shown that the greater palatability of the higher priced cuts of beef is associated with a higher percentage of organic extractives in the lean meat. While the organic extractives have practically no food value, as the term is ordinarily used, yielding but little energy or structural material to the body, they are known to be potent in stimulating the digestive glands, especially the gastric glands, and thus probably play an important rôle in digestion.

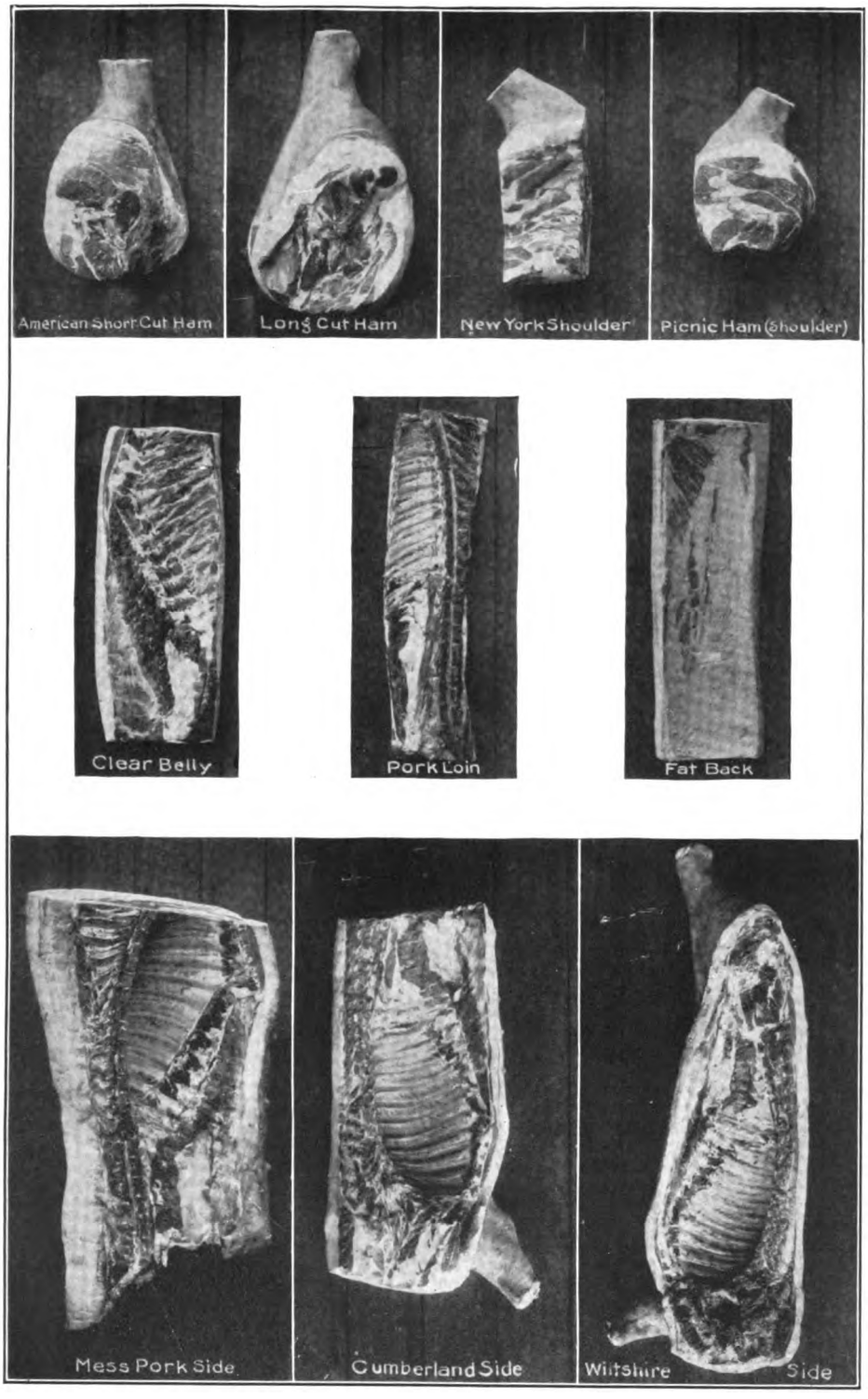
From one-tenth to one-third the cost of food in the average family is paid out for meats. Some facts are given therefore which throw some light on the question as to the desirable qualities of beef. Beef is used to illustrate the matter of quality because it is pre-eminently the most popular flesh food and because quality means more in beef than in mutton or pork, especially the latter. If all the desirable qualities of beef could be secured in one cut it would be palatable, nutritious and economical. This is practically impossible, however; there are wider differences in cuts of meat as to palatability and cost than as to food value, while the less ex-

pensive cuts may be rendered more palatable by proper methods of cooking. Palatability of beef depends upon tenderness, juiciness, quality and flavor. Tenderness, juiciness, quality and flavor depend upon the age of the animal, the location of the cut, the condition of the animal as to ripeness, the degree of ripeness of the meat and the method of cooking. As a rule the younger the animal the more tender the meat. Perhaps nothing, however, has more influence upon tenderness than cooking,—different cuts requiring different treatment. The flesh of young animals invariably lacks that fine marbled appearance, or distribution of fat throughout the muscular tissue that is so characteristic of beef of high quality taken from mature bullocks that are in a finished or well-fatted condition. The beef of young cattle is also more or less lacking in flavor. Satisfactory flavor in beef is of course largely a matter of individual preference, but a reasonable state of maturity and development is required to give beef its most characteristic flavor. It is significant that the more tender cuts of beef, such as the tenderloin, lack noticeably in flavor. Good judges agree that the best flavored beef comes from muscles which are frequently used during the life of the animal. This exercise renders these muscles tougher, but of distinctly higher flavor. Beef cut from cattle of rather advanced age, or for that matter from cattle of any age, is rendered relatively more tender by the ripening process. Fresh beef that has not hung in the cooler for 10 days to two weeks lacks both in tenderness and flavor. Even a longer time in cold storage is desirable with the highest grade of beef. The beef cut from well-fattened steers of good quality or containing a high percentage of beef blood can be much more satisfactorily ripened in cold storage than that cut from mongrel bred steers which have been slaughtered in an indifferent condition. Carcasses of prime steers possess a characteristic coating of surface fat which protects the lean beef from too much exposure and gives it an opportunity to fully ripen. In the case of the carcass from the medium and common grades the beef frequently lacks that surface fat which seems to serve such a useful office during the ripening process. Low grade beef will literally rot before it will ripen. Juiciness in beef is largely dependent upon the percentage and distribution of fat, and the method of cooking. While an abundance of fat anywhere on a cut of beef adds materially to its apparent juiciness, an even distribution of fat throughout the muscular tissue, a condition which gives to the meat when carved (especially when cold) that beautifully marbled appearance, is the leading factor in contributing ideal juiciness to the beef. Juiciness may be easily destroyed by too prolonged roasting or broiling. The marbled quality in beef is seldom seen except in reasonably mature well-fatted cattle.

Prime condition in the live animal is essential for producing high quality in beef and other meats as well. In order to secure the highest quality in meats the consumer must pay a relatively high price for the cuts of meat or buy considerably more fat than can be agreeably eaten along with the lean of the cut, thus making it necessary to utilize the superfluous fat for other purposes or consider it as waste or refuse. In either instance it renders the edible meat of high quality relatively high priced as compared with low grade meat. On the other hand, meat of high quality need not necessarily be the most expensive for the consumer to purchase, for, when properly cooked, it is so delightfully tender and juicy that all of it is edible, save possibly a small amount of superfluous fat. However, this extra fat is of such quality that it can be readily rendered and used for cooking purposes to supplement or in some instances satisfactorily take the place of more expensive shortening. Another fact which should not be overlooked is that the cheaper, and as generally considered, less palatable cuts taken from a carcass of beef possessing high quality are often fully as desirable as the best cuts from low grade carcasses.

Packing.—The packer or slaughterer of meats is willing to pay a premium for animals in prime or well-fatted condition because when slaughtered they yield a higher percentage of dressed meat, fat, and, in the case of cattle, hides. Not only is this true, but the packer understands that prime condition in the live animal is a strong indication of high quality in the carcass. In fact, it may be said that condition is a prime requisite for producing high quality. It has a greater influence undoubtedly than high breeding. Again, the packer pays a premium for cattle prime in condition and prime in quality, or good breeding, because in well-bred animals the percentage of high priced cuts is greater than in mongrel or indifferently bred stock. Undoubtedly, the tendency of the meat trade for several years has been to concentrate a large part of the slaughtering of the country at leading market centres like Chicago. In other words, gigantic and powerful packing companies have developed from small beginnings until they have within their combined power the ability to practically regulate the market for live cattle, hogs and sheep and meats the world over. Chicago is the greatest live stock and meat market in the world. A large majority of local meat markets in the cities and villages throughout the United States are supplied through the medium of the packing-houses located at our leading livestock markets. Packing-houses can furnish any grade of meat desired. For example, in beef they can supply all grades from No. 1 to canning stock at prices corresponding with the quality. So economically is the business of the packing-houses administered and so well organized are the various industries growing out of the wholesale slaughter of meats that it is possible for them to sell practically all grades of beef in cities and villages remote from their central plant at prices which successfully compete with local competition. The local purveyor of meats can buy whatever grade of meat he can dispose of to advantage. As a rule in the smaller cities and villages the retailer buys a medium to low grade carcass, because his trade is not willing to pay prices which of necessity must be paid to secure meat of high quality. It is safe to say that the beef offered at such markets is seldom above No. 2 in grade, no matter whether the market is supplied by packers or local slaughterers.

It is impossible to predict the ultimate effect upon the meat trade of the change from local to packing-house slaughtering. On the one hand a packing-house trust can control the price of


American Short Cut Ham
Long Cut Ham
New York Shoulder
Picnic Ham (Shoulder)
Clear Belly
Pork Loin
Fat Back
Mess Pork Side
Cumberland Side
Wiltshire Side

live cattle, sheep and swine in such a manner as to reduce, temporarily if not permanently, or in some instances, destroy entirely the profits of the meat producing industry; on the other hand, such a trust can control the price of meat in the carcass to such an extent as seriously to discourage the consumption of meat by raising the price to such a degree that it will become one of the most expensive articles of diet. This power is not likely to be permanently exercised to the disadvantage of the public good, for it should be borne in mind that the very life of the packing business depends upon an active demand for meats by the consuming public. This demand will not exist when prices of meats are too high as compared with other foodstuffs. Producers will cease to prepare livestock for the block when the business becomes clearly unprofitable. In other words meat is not an absolutely necessary part of the diet of the masses, nor is the permanency of agriculture dependent upon continuous livestock production.

Consumption and Production.— Notwithstanding improved methods for meat production the actual cost of cattle, sheep and swine as put upon the market by producers the world over is steadily on the increase. Nowhere is this increased cost any more manifest than in the United States. Changes already referred to in the methods of slaughtering and increased cost of production of meats have not lessened the gross or even the per capita consumption of meats in the United States or Great Britain. The per capita consumption of beef in the United States has increased in the last few years, while it is probable, although statistics are wanting to substantiate the statement, that the per capita consumption of other meats has increased still more.

The following table shows the annual per capita consumption of meat, including beef, mutton and pork, for different countries:

ANNUAL PER CAPITA CONSUMPTION OF MEATS.*

COUNTRY	Bureau of Statistics and other authorities	Royal Statistical Society, 1902	Ostertag for 1890	Mulhall published in 1899
Argentina	.....	.....	.....	140
Austria-Hungary	.....	.....	64	.....
Australian Commonwealth	.....	262.6	246	208 [1]
Belgium	.....	70	.....	.....
Belgium and the Netherlands	.....	.....	69	.....
Canada	.....	.....	.....	129
Cuba	124	.....	.....	.....
Denmark	.....	76	.....	.....
France	78.9	80	74	75
Germany	117.1	99	70	74 [2] / 66 [3]
Great Britain	.....	.....	105	115 [4]
Greece	.....	.....	.....	58
Italy	46.5	.....	23	27
Netherlands	.....	.....	.....	48
New Zealand	.....	212.5	.....	.....
Poland (Russian)	.....	.....	.....	62
Portugal	.....	.....	.....	44
Russia	.....	.....	48	50 [5]
Spain	.....	.....	49	.....
Sweden	.....	62	.....	.....
Sweden and Norway	.....	.....	87	74
Switzerland	.....	.....	.....	75
United Kingdom	.....	121.3 [6]	.....	108 / 93 [7]
United States:				
Dressed	185.8	150 [8]	120	141
Dressed and extra edible parts	220.5	.....	.....	.....
Edible dressed and extra edible parts	182.6	.....	.....	.....

[1] Including New Zealand. [2] 1899. [3] 1883. [4] 1895.
[5] Excluding Poland. [6] 1898–1902. [7] 1875. [8] 1885.
* *Crop Reporter*, February 1912.

MEAT ANIMALS OF THE PRINCIPAL COUNTRIES OF THE WORLD.

COUNTRY	Cattle	Swine	Sheep	Goats
United States (1917)	63,617,000	67,453,000	48,483,000	.....
Argentine (1916)	25,866,763	3,197,337	43,225,452	4,563,808
Australia (1916)	9,979,000	880,000	72,866,000	.....
Austria-Hungary:				
Austria (1910)	9,160,009	6,432,080	2,428,101	1,256,778
Hungary (1913)	6,206,867	6,824,657	6,659,858	268,752
Belgium (1913)	1,849,484	1,412,293	.....	.....
Brazil (1916)	28,962,180	17,329,210	7,204,920	6,919,550
Bulgaria (1910)	1,606,363	527,311	8,669,260	1,464,719
Canada (1917)	*3,202,283	3,619,382	2,369,358	.....
	†4,718,657			
Denmark (1917)	2,458,158	1,650,623	480,007	.....
France (1917)	12,443,304	4,202,280	10,586,594	.....
Finland (1914)	1,167,112	§418,000	1,309,000	13,000
Germany (1917)	21,462,371	2,763,610	6,167,469	.....
India, British (1914)	‡125,042,000	.....	23,092,000	30,673,000
India, Native Stock	‡12,236,000	.....	¶8,306,000	.....
Italy (1914)	6,646,000	2,722,000	¶13,824,000	.....
Japan (1915)	1,387,922	333,276	2,768	97,396
Mexico (1902)	5,142,000	616,000	3,424,000	4,206,000
Netherland (1917)	2,301,532	1,185,438	520,275	.....
New Zealand (1917)	2,502,700	278,186	25,270,386	.....
Norway (1916)	1,119,875	221,146	1,282,271	229,981
Rumania (1917)	1,049,702	371,205	1,655,110	84,197
Russia (1914), incl. Poland, Caucasus, Siberia, Central Asia	52,052,000	14,995,000	¶72,273,000	.....
Spain (1916)	3,070,903	2,814,465	16,012,277	3,207,360
Sweden (1917)	3,202,381	1,029,976	1,344,202	.....
Switzerland (1916)	1,615,645	544,021	171,635	358,993
Union of South Africa (1911)	5,796,949	1,081,600	30,656,659	11,762,979
Great Britain	12,342,268	2,998,657	27,770,555	.....
Ireland	4,907,466	947,572	3,744,453	268,853
Uruguay (1908)	8,192,602	180,099	26,286,296	19,951
Other countries (1911–1915)	6,400,000	6,100,000	48,150,000	29,400,000

* Includes milch cows. † Other cattle. ‡ Includes small buffaloes. § 1910. ¶ Includes goats.

Per capita consumption of meat in all countries for which the information is obtainable, probably of dressed weight is expressed in pounds, unless otherwise stated. For Germany, some parts are included in addition to dressed weight in the preceding table.

From this table it is evident that the per capita meat consumption for the different countries reported varies within wide limits, Italy ranking lowest and the Australian Commonwealth highest. The high figure for the latter country is largely fictitious, due to the excessive waste of meat and meat products for which the Australian is noted. The low figure of 46.5 pounds of meat as the per capita consumption in Italy is the result of a thorough investigation of the slaughter of meat animals in every commune in Italy, made by the Director-General of Public Health. The per capita figure for the United States ranks third in the list. Of the estimates given in the table of the meat consumption in this country, those of the Bureau of Statistics are undoubtedly the most accurate; and of the three figures given, the last, representing the per capita consumption of edible dressed meat and of other edible portions of the carcass, is undoubtedly the most significant as indicative of the actual consumption of meat.

As a nation the United States leads all others in the production of meat. The table presented on p. 495 shows that the United States produces one-third of the world's supply of beef. The United States also produces more than one-half the pork and one-seventh of the mutton of the world.

The accompanying tables are interesting as showing the relative amounts of beef, mutton and pork consumed in a few of the principal countries:

AVERAGE PER CAPITA AND PER FAMILY CONSUMPTION OF MEAT PER YEAR IN THE UNITED STATES.*

CLASS OF MEAT	Consumption of edible dressed meat and of extra edible parts combined: Per capita pounds	Per private family of 4.6 persons pounds	In per cent of total consumption per cent
Veal	7.7	35	4.20
Beef, except veal	75.3	346	41.23
Total beef	83.0	382	45.43
Lamb	5.0	23	2.72
Mutton, except lamb	6.3	29	3.46
Total mutton	11.3	52	6.18
Pork, including lard	88.4	407	48.39
Total	182.7	841	100.00

* Bulletin 55, U. S. Dept. Agr. Bur. of Stat. "Meat Supply and Surplus, with Consideration of Consumption and Exports." 1907.

The table clearly indicates the preponderate and almost equal importance of beef and pork in the American dietary. Of beef, mutton and pork alone, the estimates point to a yearly consumption, by the average American family of 4.6 persons, of a little over half a ton of dressed meat (1,014 pounds) or of a little over two-fifths of a ton of edible meat.

CONSUMPTION OF MEAT IN GERMANY FOR 1904-06, INCLUSIVE.

(Bulletin 55 Bureau of Statistics)

Results expressed in pounds per capita per annum and in per cent of total meat consumption.

KIND OF MEAT	1904: Pounds per capita	1904: Per cent of total	1905: Pounds per capita	1905: Per cent of total	1906: Pounds per capita	1906: Per cent of total
Beef, incl. veal	38.4	35.4	34.6	34.2	33.7	34.1
Mutton and lamb	2.1	2.0	2.2	2.2	2.1	2.1
Pork, incl. lard	66.0	60.8	62.2	61.5	60.8	61.7
Goat meat	0.9	0.8	0.9	0.9	0.9	0.9
Horse meat	1.1	1.0	1.2	1.2	1.2	1.2
Other meat*	.....	....	.....	....	.....	.....
Total	108.5	100.0	101.0	100.0	98.7	100.0

* Too small for expression.

PER CAPITA CONSUMPTION OF MEAT PER ANNUM IN THE UNITED KINGDOM, AVERAGE FOR 1898-1902.*

Results expressed in pounds

KIND OF MEAT	Domestic	Imported	Total
Beef and veal	35.9	20.9	56.9
Mutton and lamb	17.0	10.5	27.5
Pork	14.6	22.2	36.8
Total	67.5	54.3	121.8

* Vols. 65 and 67, Royal Statistical Society.

Williams has conclusively shown that the importation of American and other foreign beef and mutton has materially reduced the London wholesale price of these meats. His statement is here reproduced:

Average wholesale price of beef in London markets:

1876-80 from 5½d. to 8 d. per pound.
1895 from 2½d. to 6½d. per pound.

Average wholesale price of mutton in London markets:

1876-80 from 7½d. to 9 d. per pound.
1895 from 2½d. to 7½d. per pound.

The total amount of meat products exported from the United States in 1915 was 75,243,690 pounds, valued at over $900,000,000. In 1916 50,416,690 pounds valued at $780,000,000 were exported. Meat production is one of the leading industries of the farms in Iowa, Illinois, Missouri, Indiana and Ohio. In fact wherever corn thrives there we find meat production an important industry. Corn is undoubtedly more largely used in meat production than any other feed. The problem of economic meat production in the United States is largely a question of the best method of utilizing corn and its by-products. There is a gradual and apparently necessary and certain change, just beginning, which will have an important bearing upon beef production in the United States. With the closing of many ranges in the range country which have hitherto furnished a high percentage of stockers and feeders which have been finished on the corn belt, or at any rate upon corn grown in the corn belt, the problem presents itself, where are cattle feeders to look for their future supply of feeding cattle? Everything points to the conclusion that ultimately more of the cattle fatted for the market on the high-priced lands in the corn belt will be bred and reared there. In other words the entire process of beef production will necessarily be

carried on by the majority of cattle men. As it is, about 85 per cent of the native beef cattle marketed in Chicago have been previously bought as feeders and finished by cattle feeders who do not breed or rear the cattle they feed. The tendency in meat production at present is to put livestock in marketable condition and market them at an earlier age. This system involves better bred animals, more liberal feeding and a large use of nitrogenous feeds.

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MECCA, mĕk'ą, or **MAKKA,** Arabia, the holiest city of Islam, the capital of the province of Hedjaz, about 49 miles due east of Jiddah, its port on the Red Sea, with which it has telegraphic communication. The Mohammedans call it Umm-al-Kora, "Mother of Cities," and it derives its sanctity from having been the birthplace of Mohammed. The city stands in a narrow, sandy valley, enclosed by barren hills from 200 to 500 feet high, and is supplied with water from the mountains to the east by an aqueduct built in the 9th century, by Zubaidah, wife of Haroun-al-Raschid. The great mosque Beitu 'llah (House of God) or El-Haram (The Inviolable), enclosing the Kaaba (q.v.), the Moslem "holy of holies," occupies a central square which divides the city into the northern upper and the southern lower towns. The unpaved streets are wider than is usual in Oriental towns, and the houses of stone, often three stories high, are lighted with windows looking on the street, giving them an Occidental appearance. The stationary population is about 60,000, but the city is large enough for more than three times that number, and is annually filled at the time of the Hadj or pilgrimage to the Kaaba, when apartments in almost every house are rented to strangers. This pilgrimage customary among the Arabs in early and idolatrous ages, and subsequently enjoined by Mohammed on all his followers, is the foundation of Mecca's fame, and the only source of the inhabitants' wealth and occupation.

The Meccáwi, or inhabitants of Mecca, are, with the exception of a few Hedjázi Bedouins, all strangers by birth or parentage. They are, in fact, settlers or children of settlers, attracted hither by the love of gain, and as they care nothing for learning, the colleges of Mecca have fallen to decay, and the libraries, once rich, have disappeared. Mecca during the pilgrimage becomes for three or four months in the year the greatest market in the East.

The pilgrims converge upon the holy city from three directions; those coming from the south are Mohammedans from Oceanica, Java, Sumatra, Indo-China, India, Turkestan and southern Persia, who pass into the Red Sea through the Strait of Bab-el-Mandeb and on to Jiddah, the port of Mecca; the northern branch of the pilgrims, north Persians, Turcomans and people from Asia Minor and European Turkey, go southward to the holy city both by the land and sea routes; the third stream is from the west, Egyptians, Moroccans, Algerians, Tunisians and Turks, who reach Jiddah through the Suez Canal. For years past the average number of pilgrims passing through the Suez Canal to Jiddah has been 16,000, but this number is sometimes greatly exceeded; the number in 1901 was 26,000, and in 1902 was over 40,000. The northern pilgrims, however, are only a small part of those who annually convene at Mecca. The total number every year exceeds 100,000, practically all of whom are present at the fête of Bairam. The Sherifs of Mecca, direct descendants of Mohammed, are now a numerous and widely spread body. They all wear the same costume, priding themselves on the green robe which marks their descent. These nobles, as they may be called, elect the Sherif of Mecca, and their choice is formally confirmed by the Ottoman sultan. Ptolemy mentions Mecca under the designation of Macoraba. Mecca has had a chequered history. According to Arab legend Ishmael dwelt there, and his descendants were driven out by the Banu Jurhum, who were themselves ousted in turn by the Khuza'a about 210 A.D. Mohammed was born here, but for eight years was opposed by the city's nobles. In 692 Al Hajjaj laid siege to the city and on taking it slew the pretender Abdullah Ben Zobeir. From 1517 to 1916 the Sherifs of Mecca derived their authority from the Sultan of Turkey. The Wahabees took it in 1803; but in 1833 it was given up to Mehemet Ali, whose son Ibrahim was made Sheik el Haram. Upon the establishment of the kingdom of Hedjaz in 1916 Mecca came under the new régime. Consult Kahn and Sparroy, 'With the Pilgrims to Mecca' (New York 1905) and Wavell, A. J. B., 'Modern Pilgrim in Mecca' (1912).

MÉCHAIN, Pierre François André, pē-ār frăn swă, mā-shăn, French astronomer: b. Laon, France, 16 Aug. 1744; d. Castellon, Spain, 20 Sept. 1805. He became a mathematical tutor and devoted himself to the study of astronomy in his spare moments. In Paris he gained the interest of the astronomer Lalande who assisted him to a governmental position, in which he was engaged in the survey of the French coast and in astronomical observations. The Academy of Sciences elected him a member in 1782, and in 1785 he was editor of *Connaissances des Temps,* in which appear some of his most valuable scientific papers. He was commissioned by the National Convention in 1791, in company with Delambre, to measure the arc of the meridian between Dunkirk and Barcelona. The results of the calculations made failed to satisfy him because of a slight discrepancy and though now appointed a director of the conservatory at Paris he persuaded the board of longitude to commission him to measure the arc between Dunkirk and the Balearic Isles, but died of fever in Spain while on his mission. Consult Delambre, 'Histoire de l'Astronomie au dix-huitième Siècle.'

MECHANICAL DRAWING. See DRAWING, MECHANICAL.

MECHANICAL ENGINEERING is that branch of the science and art of engineering which relates specially to machinery. It is closely allied to all other classes of engineering, inasmuch as there is hardly an occupation or industry in which machines of some sort are not directly or indirectly concerned, and it is often, for this reason, difficult to draw the line clearly between one class and the other. The civil engineer who plans and supervises the building of a railroad calls to his aid the machinery used in excavating, blasting, building masonry and numberless other mechanical processes required in the work, all of which are the result of mechanical engineering. Electrical engineering would accomplish comparatively little in the production of light and transmission of power were it not for the dynamo and other machinery on which dependence is placed for the manufacture and use of electric current. Mining engineering would be of little use in devising means for extracting the coal and mineral treasures buried in the earth if suitable machinery planned by mechanical engineers could not be employed to assist the labor of men. In marine engineering it is the mechanical engineer who designs the steam plant which produces the motive power for the propulsion of the steamship, and without his assistance there would be no such a thing as a steamship. In dealing with problems relating to waterworks, the hydraulic engineer would be powerless if he could not make use of the pumps and hydraulic machinery which the mechanical engineer has devised. In every kind of industry where power is required, whether it be connected with engineering, architecture, chemistry, agriculture or any other subject, the mechanical operations involved are based on the continuous operation of the machine constituting the motive power, whether it be a steam engine or water wheel or other motor, and these are the products of mechanical engineering. When we come to fully analyze the subject, therefore, it appears that mechanical engineering so far underlies engineering of every class, and all kinds of industrial operations, that it can almost be said to sustain the whole fabric of modern civilization.

Mechanical engineering, in its strictest sense, relates simply to the design of machines. In its broad sense it covers not only their design but all matters relating to their proper construction and operation. In its common application it has for its scope both the design and construction of machines required for performing certain desired operations, and in addition the design and operation of the complete industrial plant, of which the individual machines form a part, and the construction of the plant in such a manner as to secure a successfully working whole for whatever purposes the plant is built. A large part of the mechanical engineering required at the present day consists in the assembling of machinery to produce certain desired ends, rather than in the design of the machinery itself. In many cases, the machinery has already been designed and constructed by engineers of the past and the perfected machines can be had by purchase in the market. This class of mechanical engineering covers a wide field. Perhaps its scope in this field can best be shown by referring in some detail to a familiar example. Take the case of the engineering required in a large modern hotel. The mechanical plant of such an establishment embraces a great variety of machinery, among the most important of which are the machines and appliances required for power, heating, ventilation, lighting, elevator service, distribution of hot and cold water, fire protection, refrigeration, ice-making, laundry work and cooking. The work of the engineer, although confined mainly to the mechanical plant, must, at the very outset, be directed to the building itself. The building, no doubt, accords with the modern ideas of construction which call for a framework made of iron, in the design and construction of which the architect must have the assistance of the mechanical engineer. Not only this, but there must be, at the outset, a careful consideration of the required location of the various mechanical appliances, so that in working out the details of design relating to the building the architect may provide the necessary amount of room. He must leave a place for the boilers, engines, steam turbines, dynamos, pumps, etc., which make up the steam plant, and room also for the supply and storage of fuel. Provision must be made for the reception of flues, ducts, pipes and wiring, which pass up through the building and which are distributed here and there to the different rooms. The character of the structures which may be needed for supporting the machinery, and the location of such structures, must also be planned at the outset so that the building may be prepared for them before it is too late. In the design of the mechanical apparatus, one of the first questions for the engineer to consider is the size and character of the steam plant. In dealing with this matter he ascertains all the uses to which steam is applied, embracing the generation of power, the pumping of water, the supply of steam for all kinds of heating and cooking, and that required for ventilation. With the data thus obtained he determines the total amount of steam required for all purposes and then calculates the boiler capacity needed to furnish the steam. For the next step he decides upon the type of boiler best suited for the purpose, whether fire-tube or water-tube, horizontal or vertical, or whether internally or externally fired, and fixes upon the number and size of the units as well as their location. He then makes a plan showing the location of the boilers in the building; the style of the brick setting, if externally fired; the arrangement and location of the smoke flues and of the stack or chimney to which they connect. Having done this and settled all matters relating to the accessories which form a part of the boiler plant, he takes up, in due course of time, the remaining portion of the work relating to the boiler plant, which may be described at this point because it is representative of much of the work which requires to be done in relation to the other departments of the plant. He draws up specifications describing in full detail the character of the boiler plant desired and what is expected of it as regards capacity and economy. These specifications are submitted to boiler manufacturers who are asked to furnish proposals for the construction of the plant in the manner described. When the proposals of the different

bidders have all been received, the engineer examines them, and after consulting with the owner of the property, selects one of the parties with whom to contract for doing the work. Next follows the inspection of the boilers in process of construction in the shop and erection in the building, the object in view being to determine if all the terms of the specifications are complied with. Finally, when the plant is completed and the contractor sets it to work, the engineer submits it to whatever tests may be required, and thereby determines whether the guarantees which have been made regarding the capacity and economy are fulfilled, and whether the plant performs its work with that degree of success and satisfaction that is called for by the specifications. Referring now to the construction of the remaining departments of the mechanical plant, the next thing considered is the motive power. The greater part of the power in such a plant is likely to be transmitted by electricity, and, consequently, the motive power is that required for generating electricity. (See ELECTRICAL ENGINEERING). After deciding on the number, size and type of the generator units, he must then locate them, and make a plan showing their respective locations with reference to the boiler plant and other parts of the building. At the same time there must be laid out on the plan a system of steam-piping connecting the boiler to the engines or turbines, and this must be arranged with a view to supplying steam to all other points of use, including the heating of the building. Next in order, the pumping machinery requires attention. This embraces the boiler feed pump, the various pumps used for the different classes of hotel work, the elevator pump, if the hydraulic system is employed, and the fire pump. The engineer must determine the proper size of each one according to the amount of water to be pumped, and he must select the type of pump, fix its location, show it on the plan and extend the system of steam-piping to furnish each with the proper supply. He must also plan the exhaust piping required for each engine, turbine and pump, the necessary vent pipe for carrying the waste steam to the atmosphere, and, if exhaust steam is used for heating, the required connection of the exhaust pipe to the main supply of the building. There must be a heater provided in the exhaust pipe system for heating the feed water before it is pumped to the boilers, and another heater for the supply of hot water to the building, and both of these, in their selection, location and connection, require the careful attention of the engineer. They must be properly laid out and shown on the plan. A complete system of water piping is required, connecting boilers, pumps, hydrants and elevators, to say nothing of the hot and cold water supply pipes which extend to the various rooms of the hotel, and the location of these must likewise be shown by means of a suitable plan. Not the least important part of the mechanical engineering for the building is the design and construction of the heating and ventilating apparatus. Calculations of the amount of heat and radiating surface needed, the quantity of air required to be changed in a given time and the sizes of the mains and returns are involved in this work. Here, also, the kind of the system to be employed, the location and type of the heating and ventilating apparatus, including all the necessary details, are questions which the engineer must consider and decide, and the results must be indicated by proper plans. These various parts of the work are made the subject of detailed specifications, in the manner already referred to, and, likewise, proposals for the installation of the work are obtained, contracts awarded, inspection carried on during construction and the work tested for acceptance when it is completed, all of which is done under the jurisdiction of the mechanical engineer. In much the same manner, the selection, location, construction and installation of the remaining parts of the mechanical plant, embracing elevator machinery, laundry machinery, refrigerating machinery, ice-making machines and the many other appliances concerned in the work of the hotel are carried out under his supervision.

The same class of mechanical engineering as that referred to in the above example is that involved in the design and construction of industrial plants of various kinds, such as cotton- and woolen-mills, bleacheries, paper-mills, rubber-mills, machinery and other manufactories, this branch of the profession being commonly known as mill engineering. In all of these cases the elementary parts consist of the power plant, which is sometimes operated by steam, sometimes by water and often by both, the machines in the mill or manufactory and the pulleys, shafting and belting required to transmit the power from the one to the other. The work of the mechanical engineer in these plants consists in properly assembling the various machines so as to perform their functions, the selection of an appropriate power plant and the proper design and arrangement of the transmitting apparatus required for operating them.

The work of the mechanical engineer is of paramount importance in the construction of steamships. Not only does the design of the boilers and engines on which the whole operation of the ship depends originate with him, but he is also concerned in the design, location and connection of the multitude of auxiliary steam appliances which abound throughout the vessel and which contribute so much to the comfort of the passengers. The modern steamship is required to contain all the appointments of a first-class hotel. The services of a mechanical engineer are many times more needed in its design and construction than in that of a hotel, for the reason of the contracted space in which the machinery is necessarily enclosed.

One of the most important industries in which the mechanical engineer is a leading figure is that of the steel-rail-mill. Here the plant, which is distributed over many acres of land, embraces immense blast furnaces where the pig iron is made, elevators by which the raw material is lifted to the top of the furnaces, blowing engines which produce the air-blast required at the base of the furnace, converters in which the iron is changed to steel, hydraulic lifts by which the converters are manipulated and the steel blooms moved to cars, trains of rolls with their powerful direct-connected driving engines where the rails are rolled from the masses of white-hot metal,

together with their reheating furnaces and, in addition to all these, the extensive boiler plants and the system of piping and other apparatus required for conveying and supplying the boilers with waste furnace gases, on which they largely depend for fuel. The mechanical engineer who lays out and assembles the parts of which such a plant is composed has a task the magnitude of which is commensurate only with the importance of the interests involved.

Since mechanical engineering includes in its scope not only the proper design and construction of machinery, but also its satisfactory performance, one branch of the profession relates to the determination, by means of suitable tests, whether the desired performance has been realized. This has especially to do with boilers, engines, turbo-generators and other apparatus using steam, which the engineer requires to be installed under specific guarantees of performance. The performance of boilers in the matter of economy may be specified in terms of the number of pounds of water evaporated per pound of coal, and, in that of capacity, in terms of the number of horse power developed, while that of the engine or turbo-generator may be specified as the number of pounds of feed water or dry steam consumed per unit of power per hour. The performance tests require the determination of the quantities stipulated, by actual measurement of the coal, water, steam and power under working conditions. Another branch of mechanical engineering, in a similar line, relates to the testing of materials used in construction, the object being to determine whether they have the requisite strength and physical characteristics. A sample or specimen of the material is placed in a testing machine and submitted to an actual breaking force and the amount of strain ascertained by measurement.

Having now given some explanation regarding the character of the profession of mechanical engineering, the question naturally arises as to the qualifications needed to make a success of such a profession. It hardly needs to be said of this profession more than of another that the one who adopts it should do so not merely as a means of livelihood, but because his tastes lie in the direction of mechanical pursuits, if, indeed, he does not love the profession for its own sake. No one should enter the profession who is not fond of machinery, who is not a "born mechanic" as the saying is, or who is not deeply interested, to say the least, in every kind of machine. But apart from natural inclinations there are qualifications that especially fit one for the work of a mechanical engineer. He should have a technical education so as to be thoroughly grounded in the principles of mechanics. He should not only understand these principles but he should know them by heart. He may or he may not remember the formula derived from the principle, but the principle itself should ever be at his finger's end. He should be familiar with mathematics, geometry and trigonometry. He should know the strength of materials and be able to calculate the strains occurring in structures and in machines, both at rest and in motion, so that he may design them with the proper amount of strength, or, if already designed, that he may be able to prove that they are of sufficient strength for any purpose he may desire to use them. He should know their behavior under varying conditions and should be able to detect their points of weakness and know the best methods of strengthening them when they fail. He should be a draughtsman and, what is the draughtsman's next neighbor, an inventor. He should know the processes involved in the work of the patternmaker, founder, blacksmith and machinist. He should know how to erect machinery and how to operate it after erection. He should know the practices of the trade and he should know the various articles concerned in mechanical operations which can be bought in the market, and, in a general way, their cost. He should be familiar with the different kinds of boilers, engines, turbines, pumps, water wheels, etc., in the market and their relative advantages. Not the least in importance should he be grounded in the principles of steam engineering and the laws which pertain to the generation and use of steam, not only for the operation of engines of various kinds, but for the various kinds of steam heating. He should be familiar with the steam engine indicator and be able to test a boiler or engine for capacity and economy. He should be well versed in hydraulic, pneumatic and electrical machinery. He should know about the construction and operation of the various machines of the plant he has assembled, so as to be able to judge of the correctness of their design and construction and whether they perform their functions in a proper manner and according to the specified requirements. He should be able to prepare detailed specifications of the work he plans, and he should possess sufficient literary ability to draw up a suitable report upon any question that may arise regarding the work he is called upon to perform and pass judgment upon the comparative merits of different makes of machines required for a given purpose or of the different modes of carrying on given processes. In a word, the mechanical engineer must be skilled by observation, by study and by experience in the science and art of the profession from beginning to end.

One of the leading problems confronting the mechanical engineer, whatever the special line in which he is engaged, is the reduction in the cost of production, and, what is allied to it, the attainment of the maximum result from machinery with the least expenditure of money, time and labor. As machines and processes are in a continual state of improvement, and almost all lines of business are in a continual state of growth, it does not require many years to elapse after a piece of engineering work has been completed before it must be remodeled or enlarged to meet the demands of the times. This problem of reducing the cost of production is, therefore, one which is continually before him. In the design of an individual machine, the highest aim is to reduce the number of parts and quantity of material used to the smallest amount consistent with proper operation, and to run it at the highest speed which can be safely and successfully maintained. In arranging a plant for carrying on some industrial process, the aim must be to employ machinery wherever it is possible to save the labor of men, and assemble the machines so that the least number of hands and

the least expense is required to change the raw material into the finished product. Following in the same direction is the aim to save all unnecessary waste of fuel or energy required in operating the machinery, whatever the class of work and in whatever department of the work such waste may occur.

There are many notable problems of a more specific nature than the one just named which absorb the attention of mechanical engineers and await their solution. One of these is the reduction in cost of steam power. Owing to the great amount of heat which passes to waste through the escape of exhaust steam to the atmosphere or to the condenser, amounting in the most economical engines to some three-fourths of that required in the original generation of the steam, there is a wide field for improvement in steam engine economy. Efforts have been made to reduce this waste by employing a part of the heat thus lost for evaporating some other liquid having a sufficiently low temperature of evaporation, and using the vapor thus formed to generate power in an auxiliary cylinder, thereby adding to the total power developed by the engine, and reducing in a corresponding degree the cost of the power per horse power. Another problem of the same kind is the substitution of some other motive power for the steam plant with the object of reducing its cost. Gas, oil and other forms of internal combustion engines are being widely developed for this purpose. In the conversion of coal into gas by the employment of a gas producer, and the subsequent use of the gas in the cylinder for developing power, the cost has already been reduced below that of steam power, and even better results may be expected.

The development of the steam turbine and its substitution for reciprocating engines is one of the recent problems which mechanical engineers have worked out with most efficient results. One of the most notable features in this work has been the enormous capacity of single units which have been installed in electric power plants, which would be practically impossible if reciprocating engines were used.

Another problem of mechanical engineering which is important to all business interests is that of rapid transportation by railroad. The great increase in speed on street car lines which has been produced by the adoption of electricity for driving power and the results obtained by the introduction of electric locomotives for hauling trains on certain railroads of considerable length are familiar to every one. The success already obtained makes it seem probable that the further adaptation of electricity in railroad work, not only on short lines, but on trunk lines, will meet all the requirements.

The great problem of aerial navigation, which naturally lies in the domain of mechanical engineering, seems in a fair way to be solved. Aeroplanes of sufficient power to carry the operator and one or two passengers are in successful use by expert aviators, and long flights are made with aeroplane in the air a number of hours at a stretch. The utility of the aeroplane in connection with operations of war has been demonstrated beyond question, and government provision of aeroplane fleets has become a recognized necessity the same as that of armies and navies. That part of the problem which remains to be solved is the adaptation of the aeroplane, and of the airship as well, to the transportation of passengers and freight on a commercial scale and in such a manner as to be safe and reliable, whatever the condition of air currents or state of weather.

There are other great problems of mechanical engineering, yet unsolved, which relate to the production of power by the employment of the forces of nature not heretofore utilized. One of these has for its object the utilization of the sun's heat. It has been worked out in a small way in California. A concave mirror having 1,000 square feet of surface has been employed for converging the rays of the sun upon a steam boiler which lies at its focus, and suitable mechanism is arranged for keeping the mirror always turned in the proper direction toward the sun. It is said that in full sunshine this apparatus has developed 10 horse power. Wind power is widely and successfully employed on a small scale, but there remains the problem of overcoming its variable nature by providing means for storing it, and of applying the power thus obtained without limitations. The development of tidal power, like that of wind power, is largely a problem of the storage of energy, and no success in this field has been realized.

What the future offers to a young man choosing the profession of mechanical engineering depends very much upon the ability of the man himself. The broad scope of the profession, already referred to, furnishes ample indication that there is a wide field of work for him. That there are positions awaiting the young engineer may be seen by examining the catalogues of prominent technical colleges, which record the names of graduates and their occupations. For example, in one of these catalogues the class graduated last had a total of 44 men in the department of mechanical engineering. Of this number only three are put down without employment, and one of the three is in reality employed, being a graduate student. Of the 41 holding positions, 18 are engaged in various engineering occupations connected with the manufacture of machinery, three are employed in textile mills, eight are engaged in steel works, three are connected with railroads and the remaining nine are variously occupied in engineering pursuits. If the young engineer becomes connected with an industrial business of sufficient size and importance to warrant the steady employment of a mechanical engineer, and he shows the necessary ability, the prospect is that he will in time push forward to a position of responsibility which will command a good salary and satisfy any ordinary ambition. If his desire is to establish an engineering business of his own, he can make the emoluments greater than in a salaried position, provided he is able to secure the necessary clientage, and conduct such a business to advantage. If this is his choice, the most promising course for him to pursue is to first enter the office of a successful engineer, and spend a few years in learning the business. Then, if he has the acquaintance and aptitude necessary for attracting business for himself, he can set up his own establishment, and by careful attention to the execution of his work strive for the success he seeks. In mechanical engineering, as in other professions, large emoluments await the men who rise to the top, for these are the engineers who are called

upon by individuals and corporations for consultation.

The profession of mechanical engineering offers as many attractions to those entering it as any other profession, for in this, as in others, there is always room for those who excel, and no professional man meets with success unless his work commands it.

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MECHANICAL MOVEMENTS, POWERS AND APPLIANCES. The primary, fundamental mechanical contrivances are termed the mechanical powers, seven in number and all based on the principles of either the lever or the inclined plane. The common classification is the lever, wheel and axle, cord and pulley, toothed wheels (these four operating on the lever principle), and the inclined plane, wedge and screw (operating on the principle of the inclined plane). What are known as the mechanical movements (sometimes called mechanical motions) include about 750 of the more or less simple and common combinations, covering practically all the fundamental arrangements of the mechanical powers for machine building and engineering work. They constitute the groundwork which the machinist or student of engineering must master before he can make much headway in understanding the complex problems which arise in practice.

Taking first the simple lever, it is found to be of three classes: (1) those in which the fulcrum is situated between the power and the weight; (2) those in which the fulcrum is at one end of the lever arm with the weight nearer to it than the power; and (3) those in which the fulcrum is at the end with the power nearer to it than the weight.

In the first, if the weight *W* is nearer to the fulcrum, there is a mechanical advantage —illustrated by the crowbar, which on account of the great difference in the length of its arms is advantageously used to overcome great resistance. Scissors and nippers are double levers of this class. If the power *P* is nearer to the fulcrum, there is a mechanical disadvantage, and if the weight and the power are at an equal distance on either side of the fulcrum, the power is equal to the weight and gives an arrangement similar to the ordinary balance.

The distinction between the gain of power

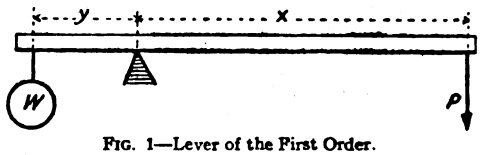


FIG. 1—Lever of the First Order.

and the loss of velocity, and the reverse of these conditions, as depending upon the position of the fulcrum, is exemplified by the shears used for cutting metal and those used for cutting cloth, respectively. In the former, short blades with long handles overcome a great resistance slowly; while in the latter, long blades operated by short handles, move quickly.

In the second class there is always a mechanical advantage. The wheelbarrow is an example of the simple lever. The fulcrum is at

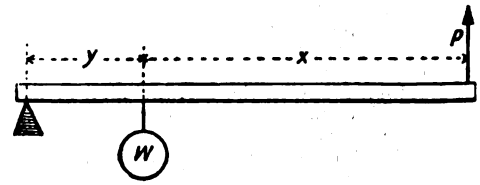


FIG. 2—Lever of the Second Order.

the centre of the wheel, the weight acts downward at the centre of gravity of the load and the power is applied at the ends of the handles. A hinged nut-cracker is an example of a double level of this kind.

In the third class there is always a mechanical disadvantage; but great rapidity of movement is obtained. The human forearm is an example of a simple lever of this class. The fulcrum is at the elbow-joint, the weight acts downward at the hand and the power is applied

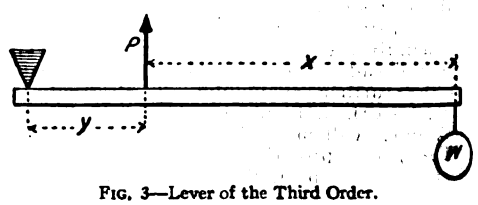


FIG. 3—Lever of the Third Order.

obliquely by a tendon from the biceps muscle attached near the elbow. A pair of tongs is an example of a double lever of this class.

The wheel and axle consists of two cylinders of different sizes rigidly connected together and turning about a common axis. The larger cylinder is called the wheel and the smaller the axle. The power is applied to the end of a rope wound around the wheel and the weight is raised by a rope wound around the axle;

see Fig. 4. The diameter of the larger cylinder or wheel being twice that of the smaller cylinder, or axle, a power of one pound at *P* will balance a weight of two pounds at *W*. This is essentially a form of lever, and «the power is to the weight lifted as the radius of the axle is to the radius of the wheel.» The principle is applicable to all forms of hoisting machines, steering gear of ships, fusee clock

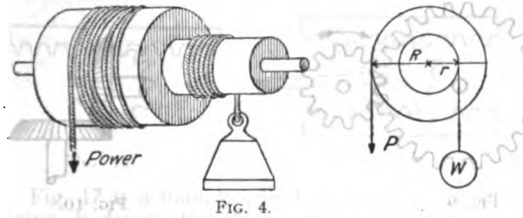


FIG. 4.

and watch movements, etc. If the axle be fixed and the wheel be loosely mounted to revolve on it, we have the ordinary machinist's loose pulley and a variety of uses suggest themselves. If the axle be fixed to the body of a carriage and the wheel allowed to rest on level ground, we find that the carriage can be drawn along with slight effort, requiring a push or pull representing only a small fraction of its weight.

The cord and pulley shows the further uses of the wheel as a lever. In the arrangement shown in Fig. 5 the upper points *F* are fixed, being virtually fulcrums; a downward pull of one pound one foot on the cord *P* will raise the weight *W*, which may weigh nearly two pounds, a half foot; it would balance two pounds but for the loss by friction.

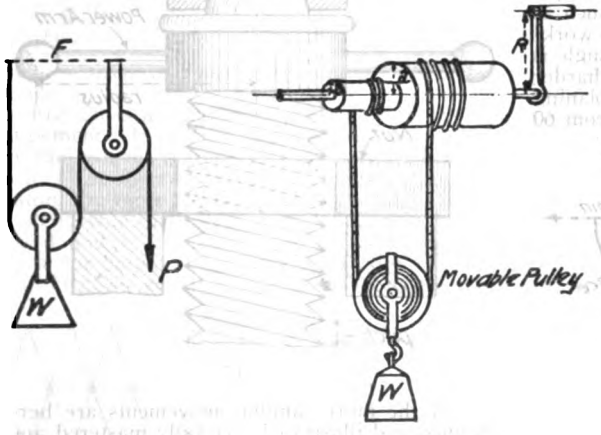


FIG. 5.

FIG. 6.

In Fig. 6 a movable pulley is shown in combination with the wheel *a* and axle *b* and a crank *R* is added. If the crank is one foot long, the wheel one foot in diameter and the axle six inches in diameter, one turn of the crank may draw up the right hand cord about three feet, and lengthen the left hand cord about 18 inches, resulting in raising the pulley and attached weight *W* 9 inches. As the crank handle has traveled about six feet, or eight times as far as the weight is raised, the leverage is 8 to 1, and a boy who can put 50 pounds of effort on the crank can raise nearly 400 pounds at every turn, and in eight turns he will raise it six feet, the distance of travel of the crank at one turn.

A very common arrangement of pulleys, called stepped pulleys, is shown in Fig. 7, as positioned for driving a lathe. The steps of the pulleys on the lathe are supposed to be 3, 6, 9 and 12 inches diameter, respectively. The belt is shown on the 12-inch power pulley and 3-inch lathe pulley, and obviously, if the power shaft is making 100 revolutions per minute, the lathe-shaft will make 400. If the belt be shifted to the next step, where the proportions are 9 to 6, the 100 revolutions of the power shaft will give 150 revolutions of the lathe shaft. On the third step 6 to 9 is the proportion and the lathe will rotate at a speed of 66⅔ revolutions; on the fourth step it is 3 to 12, and the 100 revolutions of the power shaft will give but 25 of the lathe shaft. See PULLEY.

Toothed wheels, now commonly called gear-wheels, illustrate another type of wheel leverage. Spur gears are shown in Fig. 8; here the smaller gear-wheel rotates twice to cause one revolution of the large wheel; thus a small wheel secures increased power at reduced speed.

In Fig. 9, the large wheel, being the driver, turns both the small wheels in the same direction, but oppositely to itself, and gives the shafts of the small wheels two revolutions to one of the large wheel. In Fig. 10 are shown bevel gears, which coact at right angles. It is apparent that almost infinite combinations of such gears are possible. See WHEEL GEARING.

The inclined plane is simply a rigid fixed

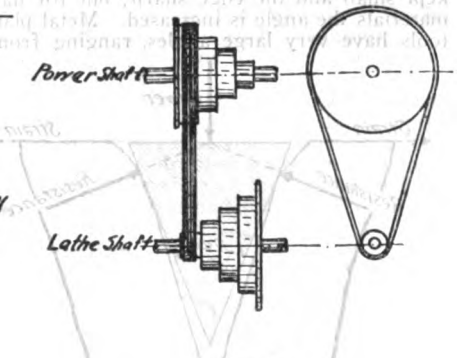


FIG. 7.

plane inclined to the horizon at an angle, and upon which a weight tends to slide down by gravity, or up the slope of which a weight may be pushed or rolled by a force usually horizontal in its action. In Fig. 11 the sliding weight would fall back if the power was withdrawn; it also shows power applied horizontally to move a rolling weight up the plane. In this latter case a continuing power of less than a pound will push a pound roller up the incline because the power has a distance greater than the height overcome in which to exert itself.

The inclined plane principle is used in rolling barrels up on a wagon, in loading logs on a sled, in the operation of a mountain railway and in the cam, which is described later. The employment of the principle does not reduce the work of lifting to the top of the plane, but extends the time of the lift, so that a smaller force used for a longer time does the work.

The screw is essentially an inclined plane wound spirally around a cylinder, in the form of an advancing groove, known as the screw-thread. A cylinder having such grooves cut interiorly like the inside of a nut is termed a female screw. The screw shown in Fig. 12 has two grooves spiraling around and is therefore double-threaded. There being eight threads to the inch, the pitch of this screw may be regarded as one-eighth of an inch, the distance between threads; or as one-fourth of an inch, the distance between one spiral and the next turn of the same spiral. The principle of the screw is used in the screw propeller (q.v.), and the lifting jack or jackscrew. See SCREW.

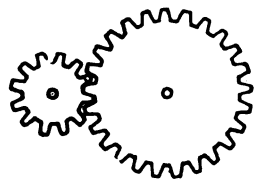


FIG. 8.

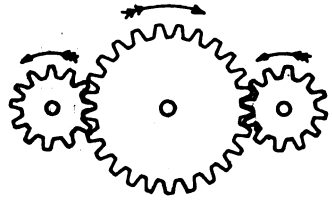
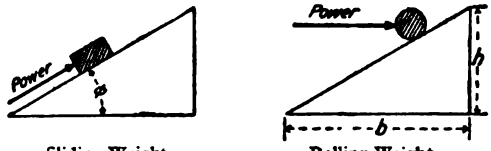


FIG. 9.

FIG. 10.

The wedge (Fig. 11a) is a double plane and gives power at the expense of speed. It is sometimes considered as a combination of two inclined planes placed base to base. The mechanical advantage increases as the angle of the wedge decreases — "the power being equal to twice the resistance into the sine of the angle of the wedge." The relation, however,



Sliding Weight. Rolling Weight.

FIG. 11.

has but little practical value since the resistance due to the friction is very great. The principle is used in many forms of cutting tools such as the knife, the chisel, axe and plane. For working in comparatively soft materials, the angle is kept small and the edge sharp; but for harder materials the angle is increased. Metal planing tools have very large angles, ranging from 60

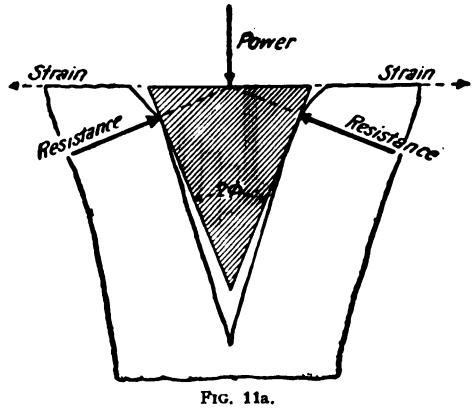


FIG. 11a.

degrees to 80 degrees. When the wedge is employed for cleaving wood, the cohesion and friction combined produces so great a resistance that the force is applied in the form of a blow from a heavy body, and the resulting strain is equal to the force of the blow multiplied by the length of the wedge divided by its width. See WEDGE.

A mechanical movement is some simple combination of the elementary powers described above. Perhaps the simplest are the familiar crank (q.v.), cam (q.v.) and cylinder and piston. (See STEAM AND STEAM-ENGINES). A

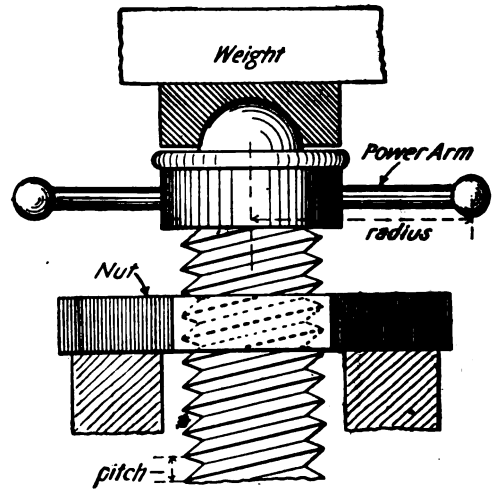


FIG. 12.

few of the more familiar movements are here grouped and illustrated. If fully mastered and understood they will be of great assistance to the student of mechanics in understanding the more difficult and complicated descriptions and drawings of modern machinery.

Fig. 13 is a rack and pinion, for converting rotary motion into linear motion, or the reverse, according to whether the rack or pinion is the driver.

Fig. 14 shows a pinion between two racks. If the lower rack be fixed and the pinion rolled one foot the upper rack will move two feet. In this way the stroke of a piston can be doubled.

Fig. 15 is a gear-wheel and worm, for changing a rapid rotary motion into a very slow rotary motion. One rotation of the worm turns the gear-wheel the distance of one tooth.

Fig. 16 is a group of bevel gears, positioned as in the differential on the rear axle of an automobile. Either of the large bevel-gears may drive the other through the small bevel-gear.

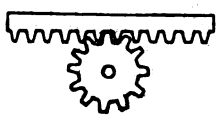


FIG. 13.

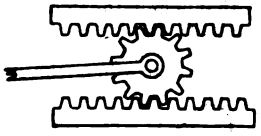


FIG. 14.

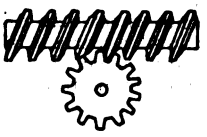


FIG. 15.

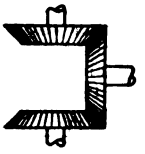


FIG. 16.

Fig. 17 is a mangle wheel and pinion. The pinion *P* drives, traveling around the long C-shaped rack, rotating the mangle first into one direction then in the reverse direction.

Fig. 18 is a pair of eccentric gear-wheels, either of which may be the driver. The rotation of the driven wheel is alternately slow and rapid.

Fig. 19 shows a couple of pump-cams. As they touch at every point of their rotation they

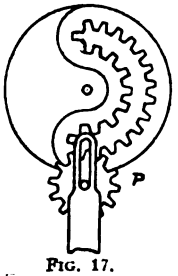


FIG. 17.

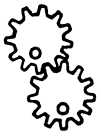


FIG. 18.

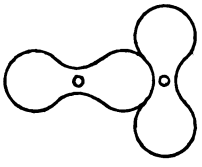


FIG. 19.

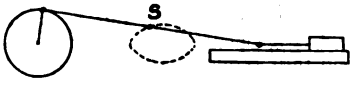


FIG. 20.

may be used to raise a column of water by lifting.

Fig. 20 is a diagram of a crank and piston movement. It will be noticed that the spot *s* on the centre of the piston rod describes an oval. The nearer this spot is placed to the piston the more elongated is the oval. If the student will make a pattern of this in cardboard and test it in various positions he will get a far better understanding of why a crank motion is so generally preferred in machinery

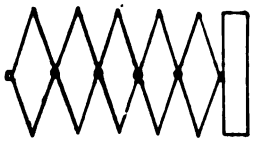


FIG 21.

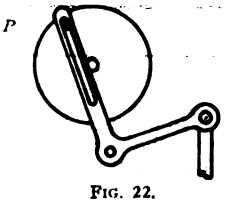


FIG. 22.

for altering rotary into reciprocating motion — the change is so gradual that jar is obviated.

Fig. 21 is a lazy tongs or combination of levers which support each other and permit rapid change of position.

Fig. 22 is a combined bell-crank and wheel-crank for altering rotary motion into reciprocating. The wheel drives and as the pin *p*

travels in the slot it raises and lowers the rod *r*, rapidly in one direction, more slowly in the other.

Fig. 23 is a parallel motion. To whatever distance the bars are moved they are held parallel by the slanting connections.

Fig. 24 is a shears for cutting metal. The wheel *w* and pin operate the upper blade, giving a long leverage for increased shearing power.

Fig. 25 is a toggle joint. Only a slight force is required to throw the two levers into line exerting a vastly multiplied energy over a short distance. It is used in many machines to apply a sudden pressure.

Fig. 26 is a universal joint, permitting a rotating shaft to be bent to a slight angle as necessary, without interfering with its working.

Fig. 27 is a three-throw cam. The three-pointed wheel measures the same at every point

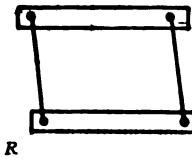


FIG. 23.

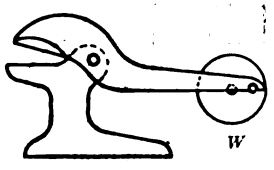


FIG. 24.

of its diameter, and as it rotates gives a reciprocating motion to the rod, moving it back and forth three times to each revolution.

Fig. 28 is a heart-cam for giving irregular reciprocation to the rod.

Fig. 29 is an ore-stamp. The cam shaped like a long *s* raises the stamp twice during each revolution and leaves it free to drop by gravity.

Fig. 30 shows a drum-shaped cam *C* whose groove moves the shaft *S* of the large wheel *W* alternately to the right and left.

Fig. 31 is an eccentric, or wheel mounted out of centre, so that through the encircling straps it gives a reciprocating motion to the rod. It is much used on steam-engines.

Fig. 32 is a pair of pulleys connected by a twisted belt for reversing the direction of rotation of one of the shafts.

Fig. 33 is a two-speed gear. The pulley *a*

being the driver, the upper large pulley is driven on one speed; when the belt is shifted to *b*, which is a loose pulley there is no driving; when the belt is shifted to *c* the other drive at a different speed is effective.

Fig. 34 is the steering gear of a sailing vessel, showing how the turning of the hand-wheel *w* is made to shift the ropes *rr* and throw the tiller *t* of the rudder to right or left.

Fig. 35 is a positive "silent" chain drive. Either the chain or gear-wheel may drive. It is used on auto-trucks and a variety of heavy machinery where belts are inadequate.

Fig. 36 is an intermittent motion given the

FIG. 25.

FIG. 26.

toothed wheel by the rotation of the notched pinion. Every time the notch comes around it advances the wheel one tooth.

Fig. 37 is an escapement. The levers are connected with a pendulum or the like and at every swing allow the wheel to turn one notch.

Fig. 38 is a ball governor as used on steam-engines. When a certain speed is exceeded the balls are thrown out by centrifugal force, and rise, opening a valve or adjusting a cut-off and thus reducing the speed back to the normal.

"Compound motions" are obtained by combining any two or more of the simple motions, and machines are built up by combining the simple motions harmoniously.

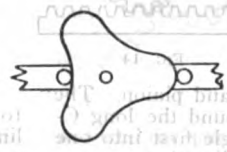


FIG. 27.

FIG. 28.

"Pendulum motion" is the oscillatory motion of a body in the arc of a circle, the body being attached to a rod which vibrates to and fro from a fixed axis. In the ideal simple pendulum, consisting of a body attached to a string without weight and vibrating from the point of suspension without resistance of any kind whatever, a material body once set in motion would continue to swing to and fro forever.

Under these conditions it has been noted (1) that the time of vibrations of a pendulum through short arcs is independent of the lengths of the arcs and that when the length of the arc is constant, as in the case of clock devices, the times of vibration are equal; (2) that when the force of gravity is constant, as is the case of any given point on the surface of the earth, the time of vibration varies directly as the square root of the length of the pendulum, so that, if a pendulum of a given length vibrates in one second, a pendulum one-quarter as long will vibrate in one-half of a second, and one four times as long will vibrate in two seconds; (3) that when the length of the pendulum is constant, the time of a vibration varies inversely as the square root of the force of gravity; and (4) that when the time of vibration of two pendulums at different points on the surface of the earth is equal, their lengths vary directly as the force of gravity. See PENDULUM.

"Perpetual motion" is a continuous or incessant motion supposed to be attainable by a mechanical device with inherent motive energy, and, therefore, which when once set in motion is capable of continuing that motion indefinitely or perpetually. Such a device or machine, if practicable, might be termed a "perpetual movement."

The various forms of mechanical movements embodying the principles of one or more of the mechanical powers already described are so innumerable that a detailed description of them is impracticable within the scope of this article; but they are classified as follows into several important groups according to the general purposes for which they are used.

"Transmission of power appliances," consisting of ropes, belts and various forms of gears, pulleys, etc.

"Measurement of power appliances and devices," used for determining velocities, pressures, weights, number and quantities, such as brakes, counters, dynamometers, gauges, indicators, meters, planimeters, testing machines and weighting machines.

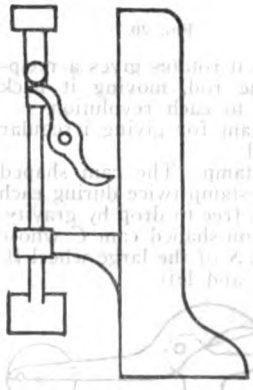


FIG. 29.

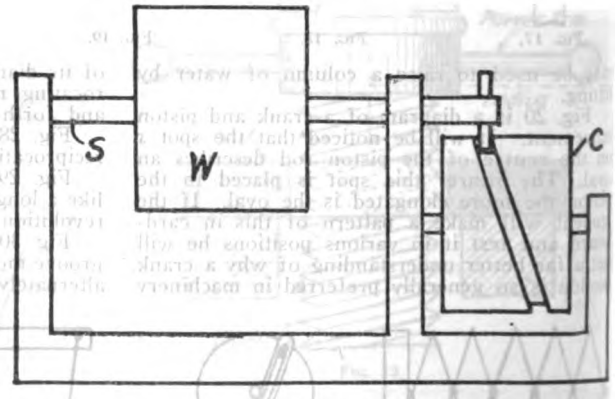


FIG. 30.

"Steam power appliances," comprising boilers, locomotives, locomotive engines, oscillating engines, rotary engines, steam-engines, steam turbines, valves and valve-gears, parallel motion gears, governors and other engine devices.

"Steam appliances," such as injectors, steam pumps, condensers, separators, traps and valves.

"Motive power machines," such as gas-engines, internal-combustion engines, heat-engines, solar engines, etc.

"Hydraulic power appliances and devices," consisting of various forms of waterwheels, water-motors, turbines, pumps, syphons, water-lifts, ejectors, hydraulic or water rams, meters, indicators, pressure regulators, valves, pipe joints, filters, hydraulic presses and hydraulic

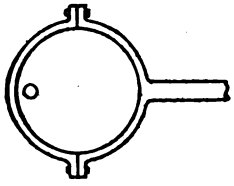
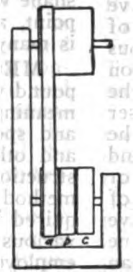


FIG. 31.

FIG. 32.



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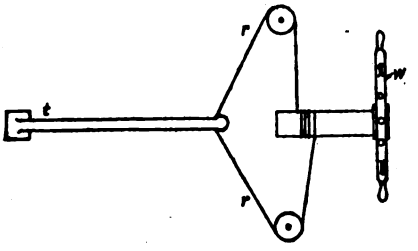


FIG. 34.

metal-working machinery such as riveters, rail-benders and punches.

"Air power appliances," devices and apparatus consisting of air compressors, air pumps, air water-lifts, barometers, bellows, blowers, blow-pipes and compressed-air tools such as pneumatic drills, hammers, riveters and shearing machines. Also, gauges, ventilators and musical instruments.

"Electrical power and construction appliances" such as generators, motors, wiring devices, controlling and measuring devices, lighting arrangements, electric furnaces, heaters, fans, searchlights and drilling machines.

"Navigation appliances" used for operating steamships, sailing vessels and yachts, such as sails, rope knots, block and tackle, paddle wheels, screw propellers, steering gear, anchors, windlasses, capstans, cranes, etc.

"Road appliances," used in the construction of roads, highways and railroads, such as scrapers, rollers, excavators, vehicles, automobiles, bicycles, motor adjuncts, wheels, road gates, lamps, etc.

"Gearing," consisting of rack and pinion devices, spiral, elliptical and worm gears, differential and stop-motion gears, and epicyclical and planetary trains.

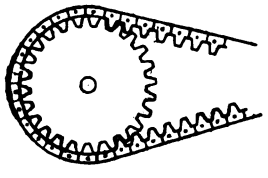
"Motion and controlling devices," consisting of rachets and pawls, cams and volute cams, cranks and variable cranks, intermittent and stop motions, wipers, shafts, couplings and gyroscopes.

"Horological apparatus and devices," mainly used for measuring time, such as spring and pendulum clocks, watch and chronometer movements, electric clocks and sundials.

"Mining machinery and appliances," such as quarrying and cutting machines, borers, drills, valves, blowers, ventilators, safety lamps, hoisting drums, conveyors, crushers, pulverizers, hydraulic nozzles, presses, air-blast and magnetic separators, steam shovels, dredges, haulage appliances, furnaces and automatic dumps.

"Mill and factory appliances," such as hangers, shaft bearings, ball bearings, steps, couplings, universal and flexible couplings, speed gears, shop tools, screw threads, hoists, stamp-mills, saws, punches, shears, bending machines, grinding machine, cotton presses, looms, knitting machines, etc.

"Engineering construction appliances," such as mixing machines, testing machines, stump and pile pulling machines, blocks and tackle, hoisting machines, tackles hooks, pile drivers, automatic dumps and dumping cars, stone grips, derricks, conveyors, timber splicers, metal welding devices, tools, wood-preserving apparatus, cable carriers, dams and embankment escalators and moving platforms, "Ferris" wheels, high structures and buildings, roof and bridge trusses, trestles and bridges.



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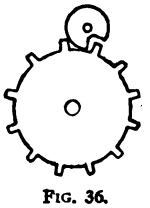
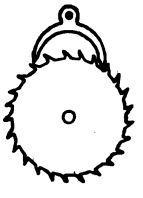


FIG. 36.



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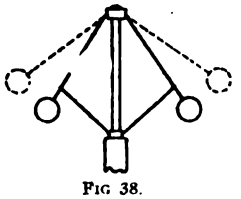

FIG 38.

"Agricultural machines and implements," such as plows, tethering hooks, wash boilers, washing machines, mowers, grain harvesters, threshing machines, cream separators, refrigerating machinery, cold storage houses, refuse crematories, silos, kilns, ovens and furnaces.

"Draughting devices," such as dividers, dotting pens, parallel rules, curve delineators, trammels, ellipsographs, pantographs, etc.

"Tools," hand and machine, such as saws, chisels, mallets, planes, borers, etc.

"Perpetual motion devices," consisting of various forms of hydraulic, hydrostatic and magneto-electric apparatus.

Bibliography.— For descriptions of a great variety of special movements, appliances and

devices, consult the works on the subject by Hiscox, Rheile, Ruleau and Spon, also the special articles on the various forms of appliances enumerated under the general classes stated in this article.

CHARLES H. COCHRANE,
Author of 'Wonders of Modern Mechanism.'

MECHANICAL SIZING. Classification of Dry Granular Material.— The mechanical classification of dry granular material is the result of the action of several natural laws operating in conjunction with a mechanical device so arranged as to permit the balancing of the action of one law with another. The combined motion places the relative action of the dry granular material completely under control of the mechanical device. The first active law in mechanical sizing is termed the laws of selectiveness. When mixed particles of various sizes of granular material are under agitation upon a level plane, the finer particles sink to the bottom and engage the surface while the coarser particles rise to the top without regard to the specific gravity of such particles. The second active law is called the law of displacement or the displacement of the centres of gravity of particles upon an inclined plane. The relative difference in the tendency of coarse and fine material of granular shape to move down an inclined plane is due to the difference in the displacement of their centres of gravity upon the same angle of plane. The third active law is the law of friction of mass or the "coefficient of friction."

Close observation of the action of these laws as well as the influence of other forces led to the design of a "mechanical sizer" simply arranged to best meet the requirements of these laws. In order to assist the law of selective action on an inclined plane, a series of several hundred tapered riffles or grooves are placed on the inclined surface of what is termed the deck of the device. This permits the "fines" to sink to the bottom of these grooves and forces the discharge of larger particles over the top of the riffle, in accordance with the action of the law of displacement of centres of gravity. This is accomplished by the feeding of dry material to the inclined deck while the same is being agitated forward and backward by a specially designed head motion, which pushes the deck forward at one speed and causes it to return at a higher speed. This sets up what is termed a progressive action of material on the deck or causes the granular particles to travel in a forward direction, under the government, however, of the law of selective action and the law of displacement aided by the law of friction of mass. Under operation, the device is fed with dry ore, sand, grain or the like, the feed engaging a feed board where a preliminary rough separation is accomplished by a modified application of tapered riffles. The feed then engages the table deck at the head of its proper zone and here, because of the length and the great number of riffles, almost any esired number of carefully sized products may be taken off by placing receptacles at the bottom and far edges of the deck, from which falls, when in action, a constant sheet of granular material graded carefully from coarse particles to fine dust.

Mechanical sizing is applicable to every form of dry granular material such as crushed ore, salt, coal, sand, emery, cereals, unbroken or crushed, or, in fact, there is no field in dry sizing now filled by metallic screen devices that cannot be filled by a mechanical sizer and often with greater economy and efficiency. This is proved by the fact that metallic screens blind and lose their efficiency while the mechanical device cannot clog or blind and automatically cleans itself. Specific gravity has practically no effect upon mechanical sizing for the reason that granular particles of the same contour and volume, when placed upon an inclined plane, have the same displacement of their centres of gravity with the result that a particle of lead and a particle of sawdust of the same size and shape will discharge from the table at the same point, although the specific gravity of the one is many times that of the other.

MECHANICAL TERMS. Words, compound words and short phrases, having definite meanings other than those of ordinary usage and specifically applicable to the use of tools and other mechanical appliances; to the construction and operation of machines, and to the methods employed and the manipulations required in the working and manufacture of the various kinds of materials used and the articles employed for engineering, structural and other industrial purposes.

A great many of these terms have been in use from the very beginning of the present period of industrial and manufacturing development, and are satisfactorily employed at the present time according to their original significance; but the creative mechanical effort of the last 40 years has either developed or produced so great a variety of mechanical devices and machines that the mechanical terminology has been expanded to include a much greater number of terms, which are more or less familiar to every one excepting those by whom they are habitually used in the execution of the particular line of work to which they are applicable.

Furthermore, the specializing methods of modern manufacturing systems, involving the restricted use of special terms, has not only tended to develop a class of one-sided workmen who are unquestionably skilful in their special lines of work and deplorably poor if not absolutely deficient in all other lines; but, the use of such methods has tended to increase the ever-widening gulf which separates any one class of workmen from the rest, by eliminating the necessity of a mutual knowledge of the special terms used in allied processes, by the special classes of workmen employed therein.

At the present time the number of mechanical terms amounts to several thousands. Eliminating those of a more or less fanciful character, and also those employed in individual shops, the terms having definite meanings capable of universal or wide application probably exceed 12,000 in number, the great majority of which are employed in the metal manufacturing and metal working industries.

A superficial examination of this terminology conveys the impression that a definite classification of the various terms would be either impossible or quite difficult, but a closer inspection shows that they may be very conveniently divided into several general classes

according to the character of the work, machines and structures to which they are applicable, as follows: (1) Terms applicable to the processes and methods employed in the production of raw materials and rough work, and in the preparation of rough work for subsequent finishing operations; (2) terms applicable to the methods, processes and machines employed in the working of suitably prepared raw material into the form of simple articles, into the parts of complex machines and into structural shapes in general; (3) terms employed in the work connected with the preliminary and final erection of machines, engines and structures; (4) terms used for the purpose of describing special forms of mechanical appliances and mechanical movements according to their field of application; (5) terms employed in operating the various classes of engines and machines; (6) general terms employed in connection with the execution of mechanical and structural engineering work; and (7) terms employed in connection with the use of the tools and appliances, and the application of the various methods and processes, in the reproductive arts.

In considering the matter of the application of technical terminology it is well to prescribe marked lines of demarcation between the terms employed in connection with the different kinds of work, as for example — between the terms applicable to mechanical work and those employed in connection with electrical work. As a rule, the distinction is quite clear, but when the terms are used for the purpose of describing appliances, devices and apparatus the line of demarcation becomes somewhat indistinct, and the precise meanings of the terms require careful consideration.

One of the most interesting examples of the varied technical application of a common term is that afforded by the use of the word "damper." It is familiarly known as a plate, valve, cover or other suitable contrivance for regulating the amount of draught in the flues of a furnace or boiler. As a specific mechanical term it is applied to the "dash-pot" or small cylinder which forms a portion of the engines of the Corliss type, in which they act as a "buffer-case" and prevent the too sudden closing of the steam and exhaust valves. As an electrical term it is applied to a metallic cylinder which is placed in such a manner that it nearly or entirely encompasses the iron core of an induction coil for the purpose of effecting a variation in the intensity of the current produced in the secondary battery. As a term employed in musical construction and operation it is applied to the strip of felt or other soft material employed in a piano-forte for the purpose of modulating the vibration of the strings.

A more varied technical application obtains in the case of the common word "pitch." As used in connection with mechanical work it refers to the distance between the centres of two adjacent teeth on a gear-wheel, to the distances between bolts, rivets and boiler stays or similar parts arranged equidistantly. Also to the inclination or rake of the teeth of saws, to the angle at which a plane-iron is set on its stock and to the height or angle of a roof-truss. As an electrical term it refers to the successive corresponding conductors on the armature of a dynamo and the number of coils advanced in making end-connections between the coils of an armature winding divided into segments. It is also applied to designate the frequency of a tone vibration produced electrically. As a musical term it refers to a succession of tone vibrations.

The character of a technical term or the class of work to which it belongs is usually very clearly indicated by the textual matter on any particular subject, but in the case of mechanical and electrical terms when the distinction is not obvious, the special character of a term may be ascertained only by the nature of the power generated, controlled or applied.

For further information see articles under the titles AERONAUTICAL NOMENCLATURE; BOILER SHOP TERMS; FOUNDRY AND FORGE SHOP TERMS; ENGINEERING TERMS; ELECTRICAL TERMS; LOCOMOTIVE, PRINCIPAL PARTS OF; TOOLS; VALVE AND VALVE TERMS, and WORKSHOP TERMS, in this Encyclopedia.

MECHANICS (*μηχανή*, a machine), or DYNAMICS, the science that treats of forces (*δύναμις*, force), and of the motions produced by them. The notion of a force, as evinced to the senses as a push or pull, is common to all, but the notion of force as that which produces or destroys motion, which is the proper definition of force, is modern, and is to be ascribed to Newton, the chief founder of the science. It is a familiar fact that two opposite pushes or pulls may neutralize each other's effects, and thus fail to produce motion; we then speak of them as forces in *equilibrium*. The portion of Mechanics that treats of forces in equilibrium is denoted by the term *Statics* (root *στα*, stand), contrasted with which we have the subject of *Kinetics* (*κινέω*, to set moving), which deals with the effects of forces in acting to produce motion in bodies. Since we can distinguish motion only in matter, the laws of motion involve the essential properties of matter, so that Dynamics is a branch of Physics — indeed, its most fundamental branch, for, until recently, it was the effort of physicists to reduce all explanations of physical phenomena to descriptions of matter in motion.* Nowadays the tendency of interpreting mechanics in electromagnetic terms is making itself felt. As in geometry, instead of dealing with actual substance, we make abstraction and conceive of points, lines and surfaces apart from the substance in which they lie, so we may make abstraction and consider the motion of points, lines or geometrical configurations, quite apart from any matter or physical properties. This geometry of moving configurations or geometry of space and time is generally distinguished by the name of *Kinematics* (*κίνημα*, motion), and is included under treatments of Dynamics only for convenience, as it is impossible to make dynamical investigations except in kinematical terms.

The ancients knew but little of Mechanics, and what they did know belonged exclusively to Statics. Archimedes was familiar with the principles of the lever and of the pulley. Leonardo da Vinci generalized the principle of the lever, and Stevinus (1548–1620) demonstrated the principle of the inclined plane and of the composition of forces. Varignon clearly enunciated the principle of moments, and also of the

* *Utinam cætera naturæ phænomena ex principiis mechanicis eodem argumentandi genere derivare liceret.* Newton 'Preface to Principia.'

composition of forces. Galileo, in the course of his investigations on the inclined plane, came to a recognition of a particular case of the Principle of Virtual Work, which was made general by Daniel Bernoulli. These are the chief names in the development of Statics. The beginnings of Kinematics were made by Galileo, who determined the laws of falling bodies, and introduced the fundamental idea of acceleration. Huygens, in his 'Horologium Oscillatorium,' published in 1673, examined in detail the laws of the pendulum, introduced the ideas of moment of inertia, of the centre of oscillation and of kinetic energy. Most important of all was the work of Newton, who in his 'Principia Philosophiæ Naturalis' (1687), not only universalized the idea of force, and introduced the notion of *mass*, but laid down the exact definitions and principles from which it has never been necessary to depart. Since the work of Newton the chief names have been d'Alembert, Lagrange and Hamilton, who have given us methods of great generality and convenience, but without changing in any essential the principles laid down by Newton.

1. STATICS.—Although the principles of Statics may be logically deduced from those of Kinetics by assuming all velocities to be zero, it is simpler to follow the historical method and treat statics first, since we may dispense with the idea of time, and thus with the preliminary study of kinematics. We begin by assuming the identical nature of all forces. For instance, the effect of any force may be neutralized by a pull on a string fastened to the point at which the force is applied. The tension on a string is produced by equal and opposite pulls on its two ends, and it may be cut anywhere, if at the cut end is applied a force equal to the one previously applied to the end. Such a force may be produced by the weight of any body hanging from the end of the string. But as a weight always acts vertically downward, while forces may act in any direction, we may suppose the string carried over a smooth pulley with horizontal axis, whose effect is assumed to be merely to change the direction of the string without changing its tension. Thus any force in any direction may be equilibrated by the tension of a string produced by a certain weight. Two forces are equal when they are equilibrated by the same weight. Two weights found to be equal (by equilibration), when hung from the same string, produce double the tension produced by one, and thus forces may be measured in terms of a single weight. A force having magnitude and direction may be geometrically represented by a line parallel to it, and of a length proportional to its magnitude. To this line an arrow-head may be attached to indicate the sense of the direction of

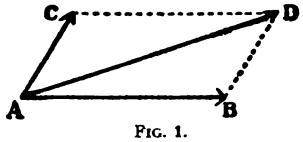

FIG. 1.

the force. We may now enunciate the principle, capable of experimental verification, that when two forces, represented by AB, AC, Fig. 1, are applied at the same material point A, they may be replaced by a single force whose direction and magnitude are represented by the diagonal AD of the parallelogram formed on the sides AB, AC. (The direction of the arrows must be observed). This is the principle of the *Parallelogram of Forces*. Obviously it may be replaced by the equivalent statement that if we form a triangle by placing at the extremity B of one of the lines representing the forces the initial point of the line representing the other force, BD, and complete the triangle, the line drawn from the initial point of the first to the terminal point of the second line will represent the *resultant* of the two forces, that being the term applied to the single force which replaces their effect. The original forces AB, AC, are said to be the *components* of AD. From the properties of the parallelogram, $AB \sin (BAD) = AC \sin (CAD)$, so that the magnitudes of the components are inversely proportional to the sines of the angles they make with the resultant. Obviously the two forces may be equilibrated by a force equal but opposite to the resultant, so that if we draw AE equal and opposite to AD (Fig. 2) the three

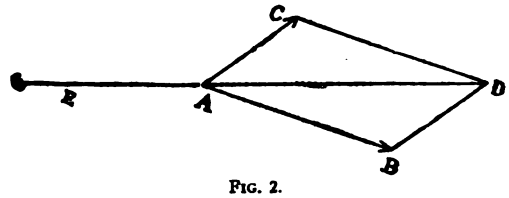

FIG. 2.

forces AB, AC, AE will be in equilibrium. As the angles BAD and BAE are supplementary, their sines are equal, similarly DAC and CAE; consequently we have $\frac{AB}{\sin (CAE)} = \frac{AC}{\sin (BAE)}$, and in turn considering each of the three forces as equilibrating the other two we get the theorem that the magnitudes of three forces in equilibrium are proportional to the sines of the angles lying opposite them respectively. This may be experimentally verified as in Fig. 3, where weights P, Q are hung

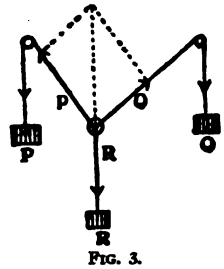

FIG. 3.

from strings passing over pulleys, and united at O to a string carrying a weight R. If a parallelogram be drawn on lengths proportional to P, Q, its diagonal will be vertical, and proportional to the weight R. A convenient form of the experiment is one in which the three strings are horizontal, and O is the centre of a horizontal circular table, on whose rim the three pulleys may be placed, their relative positions being read off on a graduation of the edge of the table.

Obviously, by a reversal of the previous process, a given force may be resolved into components in any two given directions, as only one parallelogram can be drawn on a given diagonal, whose sides have given directions. If these directions are at right angles to each

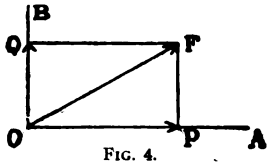

FIG. 4.

other, as in Fig. 4, OP is the *component* of OF in the direction OA and OQ the component in the direction perpendicular thereto. The length OP is called the *projection* of OF in the direction OA, and we have $OP = OF \cos (POF)$. Having found the resultant of two forces applied at a common point, we may compound this resultant with another force, and so on, the simplest rule of procedure being by an extension of the triangle method above, that is, apply the initial point of each line representing a force to the terminal point of the preceding line; then the line drawn from the first initial point to the last terminal point will represent the resultant. The slightest consideration will show that the resultant is independent of the order in which the forces are compounded. This construction is known as the polygon of forces (Fig. 5). It is ob-

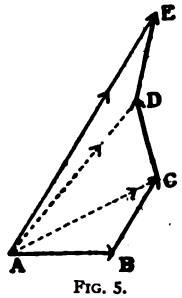

FIG. 5.

viously not restricted to forces lying in the same plane.

In order to deal analytically with the composition of forces, it is convenient to assume three rectangular axes of co-ordinates, OX, OY, OZ (Fig. 6), and to resolve every force

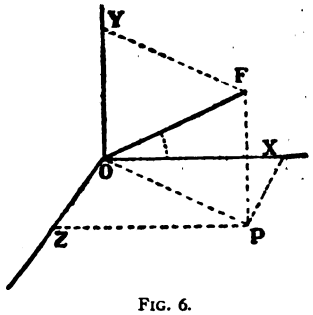

FIG. 6.

into three components along each. Thus OF may be resolved into the mutually perpendicular components OY and OP, and OP may be resolved into OX and OZ. Calling the resultant F, the components respectively X, Y, Z, we have

$$(1)\qquad \begin{aligned} X &= F\cos(Fx),\\ Y &= F\cos(Fy),\\ Z &= F\cos(Fz); \end{aligned}$$

$$(2)\qquad X^2+Y^2+Z^2 = F^2[\cos^2(Fx)+\cos^2(Fy)+\cos^2(Fz)] = F^2,$$

since the sum of the squares of the direction cosines of any line is identically equal to unity. Since the projection in any direction of any broken line is the same as that of a straight line with the same ends, it is evident that the projection of any resultant is the same as the algebraic sum of the projections of all its components. Thus the analytical expression of the principle of the parallelogram or polygon of forces is, if F is the resultant, X, Y, Z its components along the axes,

$$(3)\qquad \begin{aligned} X &= X_1 + X_2 + \ldots X_n = \Sigma X,\\ Y &= Y_1 + Y_2 + \ldots Y_n = \Sigma Y,\\ Z &= Z_1 + Z_2 + \ldots Z_n = \Sigma Z. \end{aligned}$$

Any geometrical or physical quantity which possesses direction as well as magnitude, and is compounded according to the parallelogram law, and to which the whole of the above exposition applies, is called a *vector*, and the preceding process is called the *composition of vectors*.

2. A body so small that we may neglect the differences of position of its different points is called a *material particle*. The only principle necessary for the treatment of forces acting on such a particle is that for equilibrium the resultant of all the forces applied to it must vanish. The particle may be free or it may be subject to certain geometrical constraints, for instance, it may be obliged to move on a certain surface. Then there will be certain forces acting between the particle and the bodies causing the constraint, these forces being known as *reactions* due to the constraint. A surface is said to be smooth if the reaction between it and a particle at rest is normal to the surface. Thus let F, Fig. 7, represent a

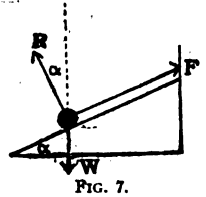

FIG. 7.

force applied to a particle of weight W, resting on an inclined plane making an angle α with the horizontal. Let F be parallel to the inclined plane. Then the three forces, W. F. and R, the reaction, normal to the plane, are in equilibrium. Writing these proportional to the opposite angles, as above, we obtain

$$(4)\qquad \frac{F}{\sin\alpha} = \frac{R}{\cos\alpha} = \frac{W}{1},$$

which determine F and R in terms of W. The same equations are obtained by resolving in the direction of the tangent and of the normal to the plane. The equation $F = W \sin\alpha$ shows that the force required to sustain a particle on a smooth plane is to the weight of the particle in the same ratio as the height of the plane to its length, as was shown by Stevinus and Galileo.

In the problem just treated, it is evident that the resultant of the applied forces W and F is opposite to R, that is, is normal to the plane. Similarly for equilibrium on any smooth surface, it is necessary that the resultant of all the applied forces shall be normal to the surface, for if it had any component parallel to the tangent plane this component would move the particle along the surface. Since the particle is constrained to move on a surface, there will be a relation between x, y, z, the co-ordinates of the particles, $\phi(x, y, z) = 0$, which is the equation of the surface; and since the direction cosines of the normal n are given by the equations

$$\cos(nx) : \cos(ny) : \cos(nz) = \frac{\partial\phi}{\partial x} \cdot \frac{\partial\phi}{\partial y} \cdot \frac{\partial\phi}{\partial z},$$

if X, Y, Z are the components of the resultant of the applied forces, we have as the condition for equilibrium

$$\cos(Fx) = \frac{X}{F} = \cos(nx), \text{ etc.},$$

or

$$\frac{X}{\frac{\partial\phi}{\partial x}} = \frac{Y}{\frac{\partial\phi}{\partial y}} = \frac{Z}{\frac{\partial\phi}{\partial z}}. \tag{5}$$

If the surface is not smooth, the reaction between the particle and the surface is not normal, but there is a tangential component which is called *friction*. The force of friction is peculiar in that it cannot produce but only hinder motion, and in having its direction determined as opposite to the direction in which the other forces tend to make the particle move. The law usually assumed governing friction is that when motion is just about to take place the friction, or tangential component of the reaction, is proportional to the normal component, the factor of proportionality being a constant for two given substances, such as those composing the particle and plane, as above. Suppose that in the problem of the inclined plane the force F is the force of friction. Then we have $F = \mu R$, where μ is a constant for the given particle and plane called the coefficient of friction. Equations (4) then give

$$F = R \tan \alpha = \mu R, \quad \mu = \tan \alpha,$$

when the particle is just about to slide down. If the plane is any steeper than the value of α thus given, equilibrium is not possible. This angle is called the *angle of friction*.

3. Let us now consider a *rigid* body, that is, one composed of a continuous distribution of matter having the property that the distance between any two of its points is invariable, no matter to what forces it is subjected. It is evident that if equal and opposite forces, P and Q, Fig. 8, be applied to such a body at

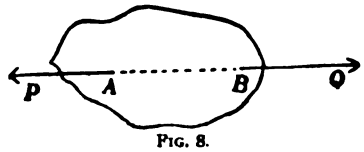

FIG. 8.

two points A and B such that the line AB has the direction of the forces, no motion will be produced, for reasons of symmetry with respect to AB. Equilibrium is also independent of the position of B on the line AB. Consequently the force Q might be applied at A, where it might be compounded with P, giving a vanishing resultant. The principle that any force applied to a rigid body may be considered as applied at any other point in its line of direction is known as that of the *transmissibility of force*. As an application, if the lines of direction of three forces, P, Q, R (Fig. 9), intersect in a common point O, they

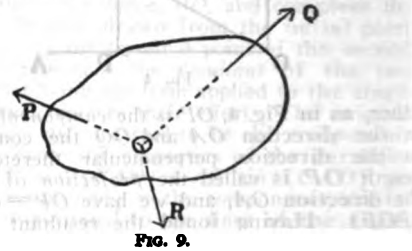

FIG. 9.

may be transferred to that point, and if they satisfy the conditions for the equilibrium of forces applied to a material particle, they will produce equilibrium of the rigid body.

Suppose we have two parallel forces P and Q applied at any points A, B, of a rigid body, (Fig. 10). If we apply at A and B any two

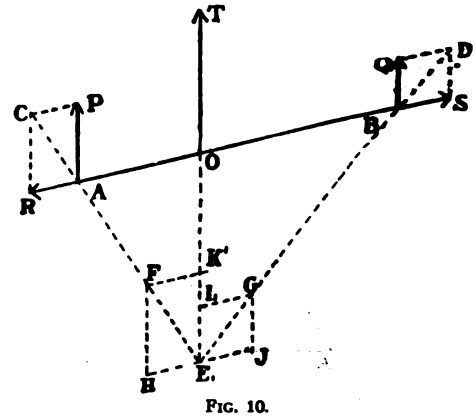

FIG. 10.

equal and opposite forces AR, BS, in the direction of AB, equilibrium will not be affected. Compound these respectively with AP, BQ, and transfer the resultants AC, BD, to the intersection of their lines of direction E and there resolve them into components in the original directions. From the equality of the parallelograms $EKFH$ and $APCR$, $ELGJ$ and $BQDS$, the components EJ and EH are equal and opposite, so that there remain only the components EK and EL, in the same direction, equal to the given forces AP, BQ, respectively. Thus the resultant of two parallel forces in the same direction applied to a rigid body is a force in the same direction equal to their sum. Obviously it may be considered as applied at any point O in the line EK. Suppose O to lie on AB. By similar triangles $\frac{AP}{AR} = \frac{OE}{AO}$, $\frac{BQ}{BS} = \frac{OE}{BO}$, and by division, since $AR = BS$, $\frac{AP}{BQ} = \frac{BO}{AO}$. Thus the distance of the intersection of the line of direction of the re-

sultant with AB from A and B is inversely proportional to the forces applied at those points. This is the principle of the lever, as known to Archimedes.

If the forces P and Q are the weights w_1, w_2, of two particles, placed at AB, the point O is called the *centre of gravity* of the two particles. It is also called the weighted mean point of points AB with the weights w_1, w_2. If we project the points A, B, O upon the co-ordinate axes, the projections of AO, BO, are in the same ratios as the lengths themselves; consequently if their co-ordinates are respectively x_1, y_1, z_1, x_2, y_2, z_2, $\bar{x}$, $\bar{y}$, $\bar{z}$,

$$\frac{\bar{x}-x_1}{x_2-\bar{x}}=\frac{\bar{y}-y_1}{y_2-\bar{y}}=\frac{\bar{z}-z_1}{z_2-\bar{z}}=\frac{m_2}{m_1},$$

or

$$(6)\qquad \bar{x}=\frac{m_1x_1+m_2x_2}{m_1+m_2},\ \bar{y}=\frac{m_1y_1+m_2y_2}{m_1+m_2},$$

$$\bar{z}=\frac{m_1z_1+m_2z_2}{m_1+m_2}.$$

By a generalization, we obtain for the centre of gravity of any number of points, or the resultant of any number of parallel forces,

$$(7)\qquad \bar{x}=\frac{\Sigma mx}{\Sigma m},\ \bar{y}=\frac{\Sigma my}{\Sigma m},\ \bar{z}=\frac{\Sigma mz}{\Sigma m}.$$

If the two forces AP, BQ, are in opposite directions, instead of Fig. 10 we have the construction of Fig. 11, and the resultant is evi-

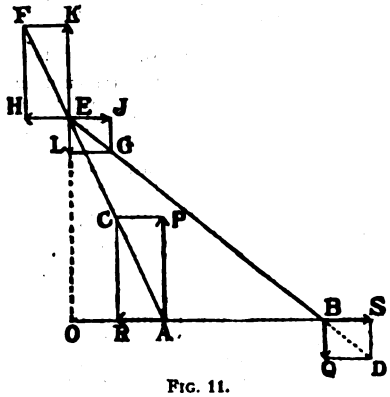

FIG. 11.

dently equal to the *difference* of the two components, while the point O lies outside the segment AB. We may say that in general the resultant is equal to the *algebraic* sum of the components. In Fig. 11, if AP and BQ are made more nearly equal, the point O recedes to a greater distance, and in the case of equality, when we have AC parallel to BD, O must be infinitely distant. The same result is given by the formulæ (6), putting $m_1+m_2=0$. In other words, two equal, parallel and *oppositely* directed forces applied to a rigid body cannot be replaced by a single resultant. Such a pair of forces is called a *couple*. The perpendicular distance between the two lines of direction of the members of the couple is called its *arm*. The product of the magnitude of either force by the arm of the couple is called the *moment* of the couple. The plane of the couple is the plane containing both

forces. We have shown that a couple cannot be equilibrated by any single force, but it may be by another couple. This couple may be chosen in an infinite variety of ways. It may easily be shown by drawing the members of the second couple as about to be prescribed, and compounding the forces two and two, by the rules already given, that the equilibrating couple may be equilibrated by any of the following, and that the given couple may accordingly be replaced by: 1° An equal and parallel couple in any plane parallel to its own; 2° An equal couple in its plane turned about its point of symmetry; 3° A couple in the same place having different arm and forces but the same moment. Thus all that characterizes a couple is the magnitude of its moment and the direction of the normal to the plane of the couple. The couple then behaves like a directed quantity, and may be symbolized by a line in the direction of the normal to its plane, whose length gives the magnitude of the moment. That couples are also compounded by the vector law is easily seen, for consider for forces of the two couples to be applied at two points AB in the line of intersection of their two planes. This can be done by bringing the couples to have the same arm. Let P_1 P_2 (Fig. 12) be the members of one couple, Q_1Q_2 those

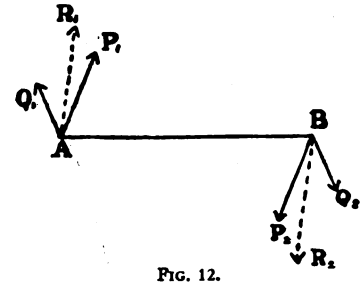

FIG. 12.

of the other. Compound P_1Q_1 by the parallelogram law to R_1, P_2Q_2 to R_2. These being equal, parallel and oppositely directed, form a couple which, having the same arm as the original couples, has its moment proportional to R, that is, found by the parallelogram construction. If lines are laid off perpendicular to the three planes of AB and P, Q, R, respectively, and proportional to the three moments, they will also follow the parallelogram law. Thus a couple may be represented by a vector perpendicular to its plane. This vector we shall speak of as *the couple*, and shall disregard the resolution into two separate forces.

Let us now consider the effect of any number of forces applied at various points of a rigid body. At any point O (Fig. 13) apply two equal and opposite forces $P'P''$ equal and parallel to a force P applied at A. We thus have the force P' equal to P applied at O instead of at A, together with the couple PP''. Similarly all the forces applied at other points may be considered applied at O, by introducing in each case a couple. All the forces at O may be compounded into a single resultant, and all the couples into a single couple. Thus the resultant of any number of forces applied to a rigid body is a single force together with a single couple. Evidently the resultant force does not depend upon the position of the

point O, while the resultant couple does. In order to have equilibrium, both the resultant force and the resultant couple must vanish.

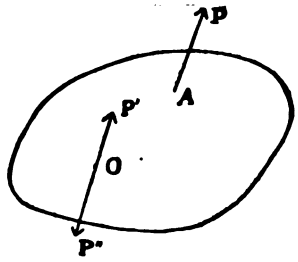

FIG. 13.

In order to express these conditions analytically, we must find an expression for the moment of a vector about a given point, that is, the product of the magnitude of the vector by the length of the perpendicular dropped upon it from the given point. This moment is thus numerically equal to the area of the parallelogram formed with the given point as one corner and the given vector as one side. As plane areas may be projected on other planes by multiplying by the cosine of the dihedral angle between them, which is equal to the angle between their normals, it is evident that the area of the parallelogram, and hence the moment, may be represented by a vector perpendicular to its plane, as already shown for the moment of a couple. Thus it is only necessary to find expressions for the three projections of a moment. Let the vector F (Fig.

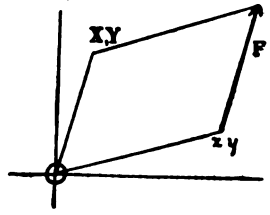

FIG. 14.

14), with components X, Y, be applied at a point having the co-ordinates x, y. Its moment about the origin is equal to the area of a parallelogram having as adjacent sides lines drawn from the origin to points x, y and X, Y. This area is equal to $xY-yX$. But this is the projection in the XY-plane of the area of the parallelogram on the lines from O to points x, y, z, and X, Y, Z. It therefore represents the Z-component of the required moment. Similarly the three components are obtained.

(8) $L=yZ-zY$, $M=zX-xZ$, $N=xY-yX$.

The moment of a couple is the sum of the moments of its two members, and if X, Y is applied at x_1, y_1, $-X, -Y$ at x_2, y_2, we obtain for the moment of the couple

$$x_1Y-y_1X-x_2Y+y_2X=(x_1-x_2)Y-(y_1-y_2)X,$$

which evidently does not depend on the choice of the origin, but only on the vector F and the *relative* position of the two points of application, since only differences of x_1x_2, y_1y_2 appear.

The analytical statement of the conditions for equilibrium of a rigid body is then

(9) $$\Sigma X=0,\quad \Sigma Y=0,\quad \Sigma Z=0;$$
$$\Sigma(yZ-zY)=0,\quad \Sigma(zX-xZ)=0,$$
$$\Sigma(xY-yX)=0,$$

the first three expressing the vanishing of the resultant force, the last three the vanishing of the resultant couple. These principles suffice for the treatment of all problems concerning the equilibrium of a rigid body. For example, the extended principle of the lever follows from the theory of moments. Consider now the problem of a ladder standing on a smooth floor and leaning against a smooth wall (Fig. 15). The resultant of the weights

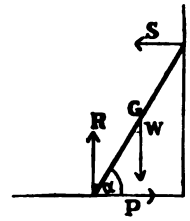

FIG. 15.

of all the parts of the ladder is a single force W applied at the centre of gravity G. Besides this we have to consider the normal reactions R and S. Resolving vertically we find for equilibrium $W-R=0$. Resolving horizontally there must be a force to balance S. Let this be P, applied at the lower end of the ladder. Then $P-S=0$. This does not determine the value of P or S, but we may do this by taking moments about any point in the plane of the figure. If we choose the lower end of the ladder, P and R will have zero moment, and if l is the length of the ladder, α the inclination,

$$Sl\sin\alpha-(Wl\cos\alpha)/2=0,\quad S=\tfrac{1}{2}W\cot\alpha.$$

If the floor is rough, and P the friction, $P=\mu R=\mu W=S=\frac{1}{2}W\cot\alpha$, $\mu=\frac{1}{2}\cot\alpha$, and if α is less than the angle determined by this equation, the ladder will slip down.

4. All the principles of statics are comprised in the Principle of Virtual Work. The conception of work is equally important with that of force. Work is done when the point of application of a force moves, the amount of work being defined as the product of the magnitudes of the force and the distance moved by the cosine of the angle included by them. If F denote the force, D the displacement, the work is $FD\cos(FD)$. This *geometric* or *scalar product* of two vectors (not a vector, since it is not associated with direction, but merely with a number, or scalar) defined as the product of either by the projection on it of the other, is of much importance in our whole subject. The cosine of the angle between two directions is given by the symmetric function of their direction cosines

$$\cos(FD)=\cos(Fx)\cos(Dx)+\cos(Fy)\cos(Dy)+\cos(Fz)\cos(Dz).$$

Now if the projections on the axes of co-ordinates of the two vectors are

(10) $$F_x=F\cos(Fx),\quad F_y=F\cos(Fy),\quad F_z=F\cos(Fz),$$
$$D_x=D\cos(Dx),\quad D_y=D\cos(Dy),\quad D_z=D\cos(Dz),$$

we have

(11) $$FD\cos(FD)=F_xD_x+F_yD_y+F_zD_z$$

as the analytic expression for the scalar product. If one of the vectors is taken as of unit length,

the expression (11) gives us the value of the projection F_s of any vector F on any direction s,

$$(12)\quad F_s = F\cos(Fs) = F_x\cos(sx) + F_y\cos(sy) + F_z\cos(sz).$$

It is easily proved that the work of the resultant of two forces in a displacement is the sum of the works of the components.

In the case of an infinitely small displacement dx, dy, dz, the work is

$$(13)\quad dW = F_x dx + F_y dy + F_z dz,$$

and if the point is moved along a curve the whole work is

$$(14)\quad W = \int (F_x dx + F_y dy + F_z dz),$$

where x, y, z, F_x, F_y, F_z, are supposed given in terms of some parameter, so that the integration along the curve can be performed.

If some of the points of a system are not free, but constrained, a *virtual* displacement is one that is consistent with the constraints. Virtual work is work done in a virtual displacement. The *Principle of Virtual Work* states that in a system of forces in equilibrium the work done in an infinitesimal *arbitrary* virtual displacement vanishes. Let us apply this principle to a number of simple cases. First, two equal weights P hanging from a string over a fixed pulley are in equilibrium. If the system is displaced one weight falls as much as the other rises. For the one that falls the displacement is in the direction of the force, and the work is positive and equal to PD. For the one that rises the displacement is opposite to the direction of the force, and the work is negative and equal to $-PD$. The sum of these two quantities thus vanishes. In the case of a weight hanging from a movable pulley (Fig. 16), if the string on the left is

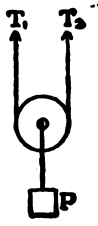

FIG. 16.

pulled up a distance D, the force T_1 does the positive work T_1D; but from the geometry of the case the weight P rises a distance of $D/2$ and the weight W accordingly does the negative work $-PD/2$. The whole work is zero, if $T=P/2$. But this is the condition of equi-

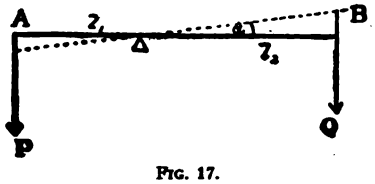

FIG. 17.

librium as found by resolution, since the tensions T_1 and T_2 are equal and we must have $T_1+T_2-P=0$. Consider a lever (Fig. 17) carrying the weights P, Q at distances l_1, l_2 from the fulcrum. Then for equilibrium the principle of moments gives $Pl_1=Ql_2$. But if the lever be turned through an infinitesimal angle α, the end A moves a distance downward $D_1=l_1\alpha$ and the weight does the positive work $Pl_1\alpha$, while the end B rises a distance $D_2=l_2\alpha$, and Q does the negative work $-Ql_2\alpha$. The whole work is zero if $Pl_1=Ql_2$, which is the condition for equilibrum. In the case of the inclined plane (Fig. 7), if the particle is displaced a small distance d up the plane, the force F does the work Fd. The weight W does the negative work $-Wd\sin\alpha$, since its direction makes an obtuse angle with the displacement. The reaction does no work, since it is perpendicular to the displacement. The whole work is therefore zero if $F=W\sin\alpha$. But this is the condition of equilibrium. The principle of virtual work is particularly convenient, since it enables us to leave the reactions out of account, since they do no work when the displacements are virtual. As a further example let us consider the equilibrium of a particle whose co-ordinates are x, y, z on a surface $\phi(x, y, z)=0$, under the action of forces whose resultant is X, Y, Z, omitting the reaction. Since the displacement is virtual, we must have $\phi=0$ during the displacement, so that

$$(15)\quad d\phi = \frac{\partial\phi}{\partial x}dx + \frac{\partial\phi}{\partial y}dy + \frac{\partial\phi}{\partial z}dz = 0.$$

The principle of virtual work says that for equilibrium

$$(16)\quad Xdx + Ydy + Zdz = 0$$

for any virtual displacement, that is, one in which dx, dy, dz are not independent, but satisfy (15). Multiplying (15) by an undetermined factor λ and adding to (16), we have

$$(17)\quad \left(X + \lambda\frac{\partial\phi}{\partial x}\right)dx + \left(Y + \lambda\frac{\partial\phi}{\partial y}\right)dy + \left(Z + \lambda\frac{\partial\phi}{\partial z}\right)dz = 0.$$

Both conditions are satisfied if we determine λ so that

$$(18)\quad X + \lambda\frac{\partial\phi}{\partial x} = Y + \lambda\frac{\partial\phi}{\partial y} = Z + \lambda\frac{\partial\phi}{\partial z} = 0,$$

or eliminating λ,

$$(19)\quad \frac{X}{\frac{\partial\phi}{\partial x}} = \frac{Y}{\frac{\partial\phi}{\partial y}} = \frac{Z}{\frac{\partial\phi}{\partial z}}.$$

But this is the condition (5) that the resultant is normal to the surface, and in fact only in this way can there be equilibrium, according to the definition of a smooth surface.

For a rigid body, a possible displacement is one in which all the points receive equal and parallel displacements, so that dx, dy, dz are the same for all. We then have

$$(20)\quad \Sigma(Xdx + Ydy + Zdz) = dx\Sigma X + dy\Sigma Y + dz\Sigma Z = 0.$$

If this is to be true for arbitrary values of dx, dy, dz we must have

$$\Sigma X = \Sigma Y = \Sigma Z = 0, \tag{21}$$

which are three of the conditions for equilibrium already found. A second possible displacement of a rigid body is one in which it is turned through an angle $d\theta$ about the Z-axis. Let us introduce polar co-ordinates, so that

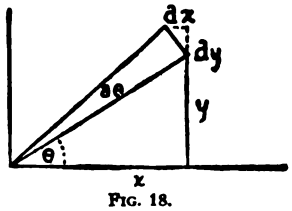

FIG. 18.

$x = r\cos\theta$, $y = r\sin\theta$. Then in the rotation, r being constant,

$$dx = -r\sin\theta\, d\theta = -y\, d\theta,\ dy = r\cos\theta\, d\theta = x\, d\theta,\ dz = 0.$$

Consequently the virtual work is

$$\Sigma(X dx + Y dy + Z dz) = d\theta\,\Sigma(xY - yX). \tag{22}$$

If this is to vanish whatever $d\theta$ we must have

$$\Sigma(xY - yX) = 0. \tag{23}$$

But this is one of the conditions for equilibrium (9) already found, and the two others are similarly found by rotating about the other axes.

Suppose now that we have any number of points $x_1, y_1, z_1, \ldots x_n, y_n, z_n$, acted on by any forces, $X_1, Y_1, Z_1, \ldots X_n, Y_n, Z_n$, and subject to any number of constraints,

$$\begin{aligned} &\phi_1(x_1, y_1, z_1, \ldots x_n, y_n, z_n) = 0, \\ &\phi_2(x_1, y_1, z_1, \ldots x_n, y_n, z_n) = 0, \\ &\quad\ldots\ldots\ldots\ldots \\ &\phi_k(x_1, y_1, z_1, \ldots x_n, y_n, z_n) = 0. \end{aligned} \tag{24}$$

Then the equation of virtual work,

$$\sum_{r=1}^{r=n} (X_r dx_r + Y_r dy_r + Z_r dz_r) = 0, \tag{25}$$

must hold for any changes of the co-ordinates which satisfy the conditions,

$$d\phi_1 = \sum_{r=1}^{r=n} \left(\frac{\partial\phi_1}{\partial x_r} dx_r + \frac{\partial\phi_1}{\partial y_r} dy_r + \frac{\partial\phi_1}{\partial z_r} dz_r\right) = 0.$$

$$\ldots\ldots\ldots\ldots \tag{26}$$

$$d\phi_k = \sum_{r=1}^{r=n} \left(\frac{\partial\phi_k}{\partial x_r} dx_r + \frac{\partial\phi_k}{\partial y_r} dy_r + \frac{\partial\phi_k}{\partial z_r} dz_r\right) = 0.$$

Multiplying these equations in turn by multipliers $\lambda_1, \ldots \lambda_k$, and adding to (25),

$$\begin{aligned} \sum_{r=1}^{r=n} \Bigg[&\left(X_r + \sum_{s=1}^{s=k} \lambda_s \frac{\partial\phi_s}{\partial x_r}\right) dx_r \\ &+ \left(Y_r + \sum_{s=1}^{s=k} \lambda_s \frac{\partial\phi_s}{\partial y_r}\right) dy_r \\ &+ \left(Z_r + \sum_{s=1}^{s=k} \lambda_s \frac{\partial\phi_s}{\partial z_r}\right) dz_r \Bigg] = 0, \end{aligned} \tag{27}$$

which is satisfied for all virtual values of $dx_1, \ldots dz_n$, if we take

$$\begin{aligned} X_r + \sum_{s=1}^{s=k} \lambda_s \frac{\partial\phi_s}{\partial x_r} &= 0, \\ Y_r + \sum_{s=1}^{s=k} \lambda_s \frac{\partial\phi_s}{\partial y_r} &= 0, \quad r = 1, 2, \ldots n. \\ Z_r + \sum_{s=1}^{s=k} \lambda_s \frac{\partial\phi_s}{\partial z_r} &= 0. \end{aligned} \tag{28}$$

From these equations, eliminating the k multipliers $\lambda_1, \ldots \lambda_k$, we have $3n - k$ equations of equilibrium.

5. KINEMATICS.— Let us now consider questions of motion. The velocity of a point is defined as the limit of the space Δs described by it to the time of description Δt, when both decrease indefinitely.

$$v = \lim_{\Delta t = 0} \frac{\Delta s}{\Delta t} = \frac{ds}{dt}. \tag{29}$$

Since displacements are compounded as vectors, the resultant of a displacement AB (Fig. 1), and another BD being AD, if the two displacements take place in the same time, the velocities are also proportional to the three lines, so that velocities are vectors, compounded by the parallelogram. Accordingly a velocity may be represented by its components along the co-ordinates axes. Its direction being that of the tangent to the path, its direction cosines are those of the tangent, $\frac{dx}{ds}, \frac{dy}{ds}, \frac{dz}{ds}$. Consequently, its components are

$$v_x = v\frac{dx}{ds} = \frac{ds}{dt}\frac{dx}{ds} = \frac{dx}{dt}, \tag{30}$$

$$v_y = v\frac{dy}{ds} = \frac{ds}{dt}\frac{dy}{ds} = \frac{dy}{dt}, \quad v_z = v\frac{dz}{ds} = \frac{ds}{dt}\frac{dz}{ds} = \frac{dz}{dt}$$

Also,

$$\begin{aligned} v^2 &= v_x^2 + v_y^2 + v_z^2 \\ &= \left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2 + \left(\frac{dz}{dt}\right)^2 = \left(\frac{ds}{dt}\right)^2. \end{aligned} \tag{31}$$

Similarly, the projection of a velocity in any direction is the velocity of the projection of the point on a line having that direction.

If a point moves in a plane it may be convenient to introduce polar co-ordinates r, ϕ.

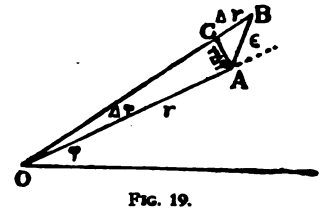

FIG. 19.

If the point moves from A to B (Fig. 19), a distance Δs in the time Δt, dropping a perpendicular AC upon the radius OB, the displace-

ment may be resolved into AC and CD, equal to $r\Delta\phi$ and Δr respectively, and accordingly the velocity may be resolved into the components in those directions.

$$(32)\qquad v_\phi = \lim_{\Delta t=0} \frac{r\Delta\phi}{\Delta t} = r\frac{d\phi}{dt},\ v_r = \lim_{\Delta t=0} \frac{\Delta r}{\Delta t} = \frac{dr}{dt}.$$

Also,

$$(33)\qquad v^2 = v_\phi^2 + v_r^2 = r^2\left(\frac{d\phi}{dt}\right)^2 + \left(\frac{dr}{dt}\right)^2 = \left(\frac{ds}{dt}\right)^2,$$

as may also be seen from the expression for the arc in polar co-ordinates. The components v_r and v_ϕ are called the radial and tangential components of the velocity respectively, while $\frac{d\phi}{dt}$ is called the angular velocity of the radius.

The area of the triangle OAB being $\frac{1}{2}r^2d\phi$, the radius vector sweeps over area at the rate $\frac{dS}{dt} = \frac{1}{2}r^2\frac{d\phi}{dt}$, but since the area is also equal to one-half the product of AB by the perpendicular on it from O, then we find this rate of area description to be equal to one-half the *moment of the velocity* about O. Using the formula (8) for moment of a vector we have

$$(34)\qquad \frac{dS}{dt} = \frac{1}{2}r^2\frac{d\phi}{dt} = \frac{1}{2}(xv_y - yv_x) = \frac{1}{2}\left(x\frac{dy}{dt} - y\frac{dx}{dt}\right),$$

which may be easily verified by passing directly from rectangular to polar co-ordinates.

6. If the velocity of a point varies we define the *acceleration* as the limit of the increment of velocity to the time in which it takes place. We may consider the numerical change,

$$(35)\qquad \lim_{\Delta t=0} \frac{\Delta v}{\Delta t} = \frac{dv}{dt} = \frac{d^2s}{dt^2},$$

or the vector change. If AB (Fig. 20) denote the velocity at a time t, AC the velocity at

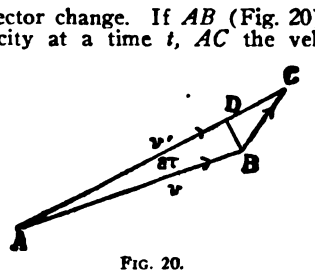

FIG. 20.

the time $t+\Delta t$, the vector increase of velocity is BC, and the acceleration is the limit of the ratio of BC to Δt. Obviously it may be resolved into any components, which are the corresponding components of BC each divided by Δt. In the triangle ABC, since the velocities AB and AC have the directions of the tangents to the path at the respective instants the angle between them is the angle $d\tau$ between the two consecutive tangents. It is obvious that the direction of the infinitesimal side BC may be anything whatever, and that accordingly the direction of the acceleration is totally unrelated to that of the velocity, that is of the tangent to the path. Resolving along the axes, we find for the components of the accelerations

$$(36)\qquad a_x = \frac{dv_x}{dt} = \frac{d^2x}{dt^2},\quad a_y = \frac{dv_y}{dt} = \frac{d^2y}{dt^2},$$

$$a_z = \frac{dv_z}{dt} = \frac{d^2z}{dt^2},$$

from which

$$(37)\qquad a^2 = \left(\frac{d^2x}{dt^2}\right)^2 + \left(\frac{d^2y}{dt^2}\right)^2 + \left(\frac{d^2z}{dt^2}\right)^2.$$

Since the direction cosines of the tangent are the same as those of the velocity, v_x/v, v_y/v, v_z/v, we may use the formula (12) to resolve the acceleration along the tangent.

$$(38)\qquad a_\tau = (a_xv_x + a_yv_y + a_zv_z)/v$$

$$= \left(\frac{d^2x}{dt^2}\frac{dx}{dt} + \frac{d^2y}{dt^2}\frac{dy}{dt} + \frac{d^2z}{dt^2}\frac{dz}{dt}\right) \Big/ \frac{ds}{dt}.$$

But differentiating equation (31) and comparing with (38), we find

$$(39)\qquad a_\tau = \frac{d^2s}{dt^2}.$$

Thus the rate of increase of the numerical velocity is equal, not to the whole acceleration, but to its tangential component. This we call the tangential acceleration, and it is equal to the limit of DC (Fig. 20), divided by Δt. The normal acceleration is easily obtained from the figure as the limit of BD divided by Δt. But in the figure we have $BD = AB \cdot d\tau = vd\tau$, so that the normal acceleration,

$$(40)\qquad a_\nu = v\frac{d\tau}{dt}.$$

Also, if ρ is the radius of curvature of the path, $ds = \rho d\tau$.

$$(41)\qquad a_\nu = \frac{v}{\rho}\frac{ds}{dt} = \frac{v^2}{\rho}.$$

The normal acceleration is always directed toward the *concave* side of the path, and is called the *centripetal acceleration*.

We will now consider some of the most important cases of acceleration. If the motion is rectilinear, the velocity and the acceleration have always the same direction, but may vary in magnitude and in sign. After uniform motion, in which the velocity is constant and the acceleration zero, so that equal spaces are described in equal times, the simplest case is that of constant acceleration,

$$(42)\qquad \frac{d^2s}{dt^2} = a = \text{const.}$$

Integrating we obtain

$$(43)\qquad \frac{ds}{dt} = at + b,$$

where b is a constant representing the velocity when $t=0$. Integrating again,

$$(44)\qquad s = \tfrac{1}{2}at^2 + bt,$$

where s denotes the space described since $t=0$. Thus if the particle start from rest ($b=0$), it describes spaces proportional to the *squares* of the times of description. It was found by Galileo that bodies fall toward the earth according to such a law, and that in a given locality the value of the acceleration is the same for all bodies. The value of this acceleration of gravity is generally denoted by g. Comparing the velocity attained by a body

falling from rest with the height, we obtain, by (43) and (44),

(45) $v = gt,\ h = \frac{1}{2}gt^2,\ v^2 = 2gh.$

Conversely, if a body be thrown upwards with a velocity v, it will reach the height h.

If we consider the motion of a body under gravity, but possessing a horizontal velocity as well as a vertical component, since there is no horizontal acceleration the horizontal velocity v_x is constant. Calling the vertical distance fallen z, the horizontal distance traversed x, we have

$$z = \tfrac{1}{2}gt^2,\ x = v_x t,$$

and eliminating t we have the equation of the path, $z = \frac{1}{2}\frac{g}{v_x^2}x^2$, representing a parabola with the axis vertical. The velocity at any point and its inclination to the horizontal are found from

$$v_z = gt = \sqrt{2gz},\ v^2 = v_x^2 + v_z^2,\ \tan\alpha = v_z/v_x.$$

If, on the other hand, the particle be projected upward with velocity v at an angle α with the horizontal, it will describe the same parabola, rising to the vertex in the time t and falling on the symmetrical half. This problem was also solved by Galileo.

Consider a particle revolving with constant velocity v in a circular path of radius r. Then since $s = vt$, by (39) we find that the tangential component of the acceleration vanishes. The normal component is given by (41) as v^2/r. Thus the acceleration is constant in amount and always directed toward the centre. It is to be observed that although the numerical velocity is constant, the vector velocity is constantly changing its direction, hence the acceleration is not zero, but is perpendicular to the velocity. If we resolve the uniform circular motion into components parallel to given directions, for instance, if P (Fig. 21) is projected into Q and R lying on the axes OX, OY, and if P revolves with constant angular velocity $\omega = \frac{d\phi}{dt}$, we have $\phi = \omega t$, $OQ = r\cos\phi = r\cos\omega t$, $OR = r\sin\phi = r\sin\omega t$. The rectilinear motion of either Q or R is called *simple harmonic motion*, or a *simple vibration*. It is evidently periodic, that is, it repeats after the interval $T = \frac{2\pi}{\omega}$. The number of vibrations in unit of time, or the *frequency*, is $\frac{1}{T} = \frac{\omega}{2\pi}$. Since the acceleration of P is constant in magnitude,

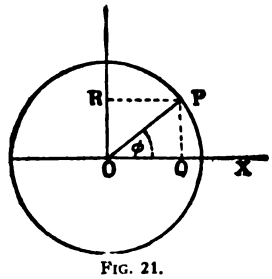

FIG. 21.

and always in the direction PO, its component along OX varies as $\cos\phi$, that is, as the distance OQ. In other words, a point describing a simple harmonic motion has an acceleration proportional to its displacement from the centre of symmetry, and directed toward it. We may also consider harmonic motion analytically. If the acceleration is proportional to the displacement but opposite in direction, we shall have

(46) $$\frac{d^2s}{dt^2} = -\omega^2 s,$$

where ω is a constant. The integral of this differential equation is

(47) $s = A\cos\omega t + B\sin\omega t = a\cos(\omega t - \alpha),$

where A and B are arbitrary constants and $A = a\cos\alpha$, $B = a\sin\alpha$. The constant a is called the *amplitude*, while the angle α, called the *phase*, depends simply upon the instant adopted from which to count the time. By taking for α the values 0° or 90° we obtain either $a\cos\omega t$ or $a\sin\omega t$.

If we compound two simple harmonic motions in lines at right angles to each other, if the amplitudes and periods are the same and the phases differ by a right angle, the previous construction shows that we obtain uniform circular motion. If the amplitudes and phases do not have this relation, we have

(48) $$\begin{aligned} x &= a\sin(\omega t - \alpha) \\ &= a(\sin\omega t\cos\alpha - \cos\omega t\sin\alpha), \\ y &= b\sin(\omega t - \beta) \\ &= b(\sin\omega t\cos\beta - \cos\omega t\sin\beta). \end{aligned}$$

Solving for $\sin\omega t$ and $\cos\omega t$

(49) $$\sin\omega t = \left(\frac{x}{a}\sin\beta - \frac{y}{b}\sin\alpha\right) \Big/ \sin(\beta - \alpha),$$

$$\cos\omega t = \left(\frac{x}{a}\cos\beta - \frac{y}{b}\cos\alpha\right) \Big/ \sin(\beta - \alpha).$$

Squaring and adding we eliminate t and obtain the equation of the path,

(50) $$\frac{x^2}{a^2} + \frac{y^2}{b^2} - 2\frac{x}{a}\frac{y}{b} = \sin^2(\alpha - \beta),$$

which represents an ellipse. The motion is called *elliptic harmonic motion*. The ellipse is evidently inscribed in a rectangle of sides $2a$, $2b$ (Fig. 22), and according to the values of $\alpha - \beta$ may have any shape, reducing to a straight line when $\alpha - \beta$ is zero or 180°. If the two harmonic vibrations are not of the same period, the resulting path belongs to a system of curves associated with the name of Lissajous. They may be easily constructed point by point, but the elimination of t will be possible only if the periods have a common measure.

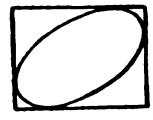

FIG. 22.

Suppose a particle subject to the constant acceleration of gravity to be constrained to

move in a vertical circle of radius l (Fig. 23). The component of the acceleration g in the direction of the tangent is $-g \sin\theta$, while the distance moved from the bottom of the circle

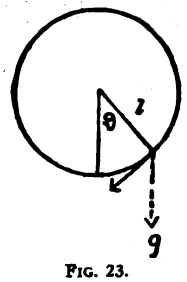

FIG. 23.

is $l\theta$. We thus have the differential equation

$$\frac{d^2s}{dt^2} = l\frac{d^2\theta}{dt^2} = -g\sin\theta. \tag{51}$$

The solution of this equation requires elliptic functions, but if θ is small enough we may neglect the difference between the angle θ and its sine, so that the equation of motion is

$$\frac{d^2\theta}{dt^2} = -\frac{g}{l}\theta, \tag{52}$$

which is the same as the equation (46) of harmonic motion with $\omega^2 = g/l$. Accordingly the small vibrations of a pendulum are harmonic, of the period $T = 2\pi\sqrt{\frac{l}{g}}$, which is independent of the amplitude of oscillation. The fact of this *isochronism* of the pendulum, or independence of the period from the amplitude, was discovered by Galileo, while the laws of uniform circular and of harmonic motion, and of the pendulum, were found by Huygens. The latter also used the formula $g = \frac{4\pi^2 l}{T^2}$ to determine the value of g.

Let us now examine the consequences of the celebrated laws discovered by Kepler as governing the motion of the planets about the sun. The first law states that the areas swept over by the radius vector from the sun to a planet in equal times are equal. Calling the area S, $\frac{dS}{dt} = \text{const.}$ But differentiating the value of $\frac{dS}{dt}$ given in (34), we find

$$2\frac{d^2S}{dt^2} = x\frac{d^2y}{dt^2} - y\frac{d^2x}{dt^2} = xa_y - ya_x. \tag{53}$$

But this is the *moment* of the acceleration with respect to the origin, and if it vanishes, the acceleration must be directed toward the origin. The kinematical interpretation of the first law is then that the planets are accelerated toward the sun. The second law states that the planets describe ellipses about the sun as a focus. The equation of a conic section referred to its focus is

$$r = \frac{p}{1 + e\cos\phi}, \quad p = a(1 - e^2),$$

where a is the major axis, e the eccentricity. Now to resolve the acceleration along the radius vector, we multiply its components a_x, a_y, respectively, by the direction cosines of the radius vector, which are $\cos\phi$, $\sin\phi$. Differentiating the equations for change of co-ordinates $x = r\cos\phi$, $y = r\sin\phi$, twice, we have

$$a_x = \frac{d^2x}{dt^2} = \frac{d^2r}{dt^2}\cos\phi - 2\sin\phi\frac{d\phi}{dt}\frac{dr}{dt} - r\sin\phi\frac{d^2\phi}{dt^2} - r\cos\phi\left(\frac{d\phi}{dt}\right)^2,$$

$$a_y = \frac{d^2y}{dt^2} = \frac{d^2r}{dt^2}\sin\phi + 2\cos\phi\frac{d\phi}{dt}\frac{dr}{dt} + r\cos\phi\frac{d^2\phi}{dt^2} - r\sin\phi\left(\frac{d\phi}{dt}\right)^2,$$

from which

$$a_r = a_x\cos\phi + a_y\sin\phi = \frac{d^2r}{dt^2} - r\left(\frac{d\phi}{dt}\right)^2. \tag{54}$$

Now by Kepler's first law,

$$2\frac{dS}{dt} = r^2\frac{d\phi}{dt} = \text{const.} = h, \quad \frac{d\phi}{dt} = \frac{h}{r^2}.$$

Changing the variable from t to ϕ,

$$\frac{dr}{dt} = \frac{dr}{d\phi}\frac{d\phi}{dt} = \frac{h}{r^2}\frac{dr}{d\phi} = -h\frac{d}{d\phi}\left(\frac{1}{r}\right).$$

Differentiating by t,

$$\frac{d^2r}{dt^2} = -h\frac{d^2}{d\phi^2}\left(\frac{1}{r}\right)\frac{d\phi}{dt} = -\frac{h^2}{r^2}\frac{d^2}{d\phi^2}\left(\frac{1}{r}\right).$$

From the equation of the path we obtain

$$\frac{1}{r} = \frac{1}{p} + \frac{e}{p}\cos\phi, \quad \frac{d^2}{d\phi^2}\left(\frac{1}{r}\right) = -\frac{e}{p}\cos\phi = \frac{1}{p} - \frac{1}{r},$$

from which

$$\frac{d^2r}{dt^2} = -\frac{h^2}{pr^2} + \frac{h^2}{r^3}, \quad a_r = -\frac{h^2}{pr^2}.$$

Thus the fact that the path is a conic section shows that the acceleration is inversely as the square of the distance from the focus. The negative sign shows that it is *toward* the sun.

The third law states that for different planets the squares of the times of description of the orbits are proportional to the cubes of the major axes. Since $2dS/dt = h$, if T is the time of a complete period hT is twice the area of the orbit.

$$hT = 2\pi ab = 2\pi a^2\sqrt{1-e^2}, \quad h^2 = \frac{4\pi^2a^4}{T^2}(1-e^2),$$

$$a_r = -\frac{h^2}{pr^2} = -\frac{h^2}{a(1-e^2)}\frac{1}{r^2} = -\frac{4\pi^2a^3}{T^2}\frac{1}{r^2}. \tag{55}$$

Now since a^3/T^2 is the same for all the planets, we see that the factor of $1/r^2$ in the acceleration is the same for all the planets. These kinematical interpretations of Kepler's laws in terms of acceleration were given by Newton.

6. KINETICS.— The whole of our experience of dynamical phenomena was summed up by Newton in his *Axioms or Laws of Motion*, which are as follows:

I. *Every body persists in its state of rest or of uniform motion in a straight line, except in so far as it is compelled by impressed forces to change that state.*

The property of persistence thus defined is called *Inertia*. The law of inertia was recognized in a less definite way by Galileo, but Newton makes of it a criterion for the existence of force, and in fact implies that if a body is moving in any other way than uniformly in a

straight line, that is, without acceleration, it is acted on by a force. The second law gives a positive definition of force.

II. *Change of motion is proportional to the moving force applied, and takes place in the direction of the straight line in which the force acts.*

In the explanation of this law, and in a corollary appended, Newton makes clear that it is intended to include the independence of effect of two simultaneous forces, and their composition by the parallelogram.

In his introductory definitions, Newton states what he means by quantity of motion, to which force is proportional, namely, the product of velocity by mass, or what is now called *momentum*, but the motion of mass is best introduced by the third law, which is perhaps the most important, as well as original, of the three.

III. *To every action there is always an equal and contrary reaction; or, the mutual actions of any two bodies are always equal and oppositely directed.*

If the force were measured by the acceleration alone, the accelerations of the two interacting bodies would be *equal* and opposite; that is not the case, but they are found to be proportional, with a factor of proportionality which is found to be always the same for two given bodies, no matter how they act on each other. For example, let them be connected by a string, and act on each other through its tension, or by an elastic cord whose length may vary. If for symmetry we write a factor for each acceleration,

$$(56)\quad m_1\frac{d^2x_1}{dt^2} = -m_2\frac{d^2x_2}{dt^2},\quad m_1\frac{d^2y_1}{dt^2} = -m_2\frac{d^2y_2}{dt^2},$$
$$m_1\frac{d^2z_1}{dt^2} = -m_2\frac{d^2z_2}{dt^2},$$

the factors m_1, m_2 are called the *masses* of the bodies, and their ratio is determined by the ratio of the accelerations. Thus we may compare the mass of any body with that of a given body taken as a unit. The usual unit of mass is the pound or the gram.

By the introduction of the conception of mass and of momentum we pass from kinematics to kinetics, or dynamics proper. As long as we were concerned with one body at a time, like Galileo and Huygens, the notion of acceleration was sufficient, but when we deal with a number of bodies with mutual actions, the notion of force is necessary. The terms on either side of equations (56) represent the forces, and the equations express the third law. The second law may now be stated by saying that force is the rate of change of *momentum*. The forces generally are known in terms of the positions of the bodies, and perhaps of their velocities, and when given by their components X, Y, Z as functions of these quantities, the equations

$$(57)\qquad m\frac{d^2x}{dt^2} = X,\quad m\frac{d^2y}{dt^2} = Y,\quad m\frac{d^2z}{dt^2} = Z$$

are called the differential equations of motion.

Our kinematical examples of the previous section may now be dynamically interpreted. The fact that bodies fall with a common acceleration g shows that the forces with which they are moved toward the earth, or their weights, $W = mg$, are proportional to their masses. The unit of force, namely, that force which produces in a pound an acceleration corresponding to an increase of velocity of one foot per second in each second, has received the name of *poundal*. The weight of each pound is accordingly g poundals. The unit generally used by scientists is the force which produces in a gram the acceleration corresponding to an increase of velocity of one centimeter per second in each second. This force is called a *dyne*, and the weight of a gram is g dynes. These units are called *absolute* units, as they do not depend on accidental circumstances of time or place, but are referred to three fundamental units, of time, length and mass, the latter two of which are preserved in concrete standards, the former is preserved in the rotation of the earth. The more familiar *gravitation unit*, which we have used in the section on statics, and which is the *weight* of the pound or gram, is not absolute, since g varies at different parts of the earth, according to the formula

$$(58)\quad g = 980.62 - 2.6\cos 2\lambda - .000003h,$$

where λ is the latitude, h the height above sea-level, and the units are the centimeter and the second. The weight of a body is accordingly variable, but its mass is invariable. For $\lambda = 45°$, at sea-level we have

Weight of pound = 32.17 *poundals*,
Weight of gram = 980.62 *dynes*.

The popular usage of the term pound or gram to denote both a mass and a force is unfortunate, and should be avoided.

The fact that the weights of bodies are proportional to their masses was carefully tested by Newton by constructing pendulums of different materials, and finding that the acceleration, as determined by the time of oscillation, was independent of the substance.

The fact that a body moving uniformly in a circle has a centripetal acceleration v^2/r shows that it is acted on by a force toward the centre (centripetal force) equal to mv^2/r. If the body, for instance, be revolved in a horizontal orbit on a whirling machine, and be held in place by a string, this string may be passed over a pulley and support a weight, so that we may thus make a comparison between the absolute dynamical measure of force and the gravitational statical one previously used. By repeating the experiment with another revolving mass, we may compare the masses of two bodies, by the process of comparing both with the same weight. This illustrates the dynamical comparison of masses. The usual statical method of comparison by a balance is actually a comparison of *weights*, and gives a correct comparison of masses because the value of g is the same at each pan. If we used a balance-beam so long that g differed sensibly at its two ends, equality of weights would not mean equality of masses.

Another simple illustration of the dynamical method of comparison of masses is furnished by Atwood's machine, by which the laws of falling bodies may be studied. Two masses, m_1, m_2, Fig. 24, are hung from a string passage over a frictionless pulley. Since the distance moved up by one mass is equal to that moved down by the other, the velocities and accelerations of the two are equal and opposite. Each

mass is acted upon by two forces, the tension of the string upwards and its own weight downwards. The tension is the same for both. Consequently we have for the acceleration a,

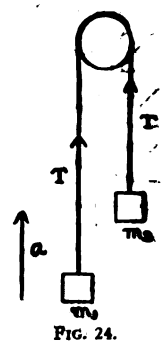

FIG. 24.

$$m_1a_1 = \quad m_1a = T - m_1g,$$
$$m_2a_2 = -m_2a = T - m_2g,$$

from which we obtain

$$a = \frac{m_2 - m_1}{m_2 + m_1}g;$$

that is, the acceleration is to that of a body falling freely as the difference to the sum of the masses. Thus by observing the acceleration the masses may be compared. In the usual use of Atwood's machine that difference of masses is produced by an extra weight, which is taken off at a certain height by a fixed ring, after which the two remaining equal masses travel with uniform velocity, and by the velocity generated the acceleration is determined.

The properties of harmonic motion show that a body acted upon by a force proportional to its displacement from a fixed point will execute a harmonic vibration. When a point has a position of equilibrium and is displaced therefrom, forces will in general be brought into play tending to restore it to its position, and these forces will depend upon the displacement. If the displacement be small enough, the forces will be approximately proportional to the displacement, hence the frequency of harmonic vibrations in nature. The vibration of the pendulum or of a tuning-fork are examples.

From the generalization that all the planets are accelerated toward the sun with an acceleration $a = c/r^2$, where c is constant for all, Newton, putting the force equal to cm/r^2, and seeing that the masses of the two interacting bodies, the sun and planet, must enter symmetrically, was led to assume $F = \gamma Mm/r^2$, and from the law of reaction this would also be the force urging the sun toward the earth. Thus he was led to the generalization of universal gravitation, namely, the statement that every mass in the universe attracts every other with a force proportional to the product of both their masses, and inversely to the square of the distance apart. (The number γ is the same for all, depending only on the units used).

Newton tested this by comparing the acceleration of the moon due to the earth's attraction with the acceleration of a body at the earth's surface. Supposing the moon's orbit to be circular, of radius r and period T, its acceleration will be by (55) $a_m = 4\pi^2 r/T^2$. If the acceleration varies inversely as the square of the distance, at the surface of the earth, it will be

$$a_s = a_m \frac{r^2}{R^2} = \frac{4\pi^2 r^3}{R^2 T^2},$$

where R is the earth's radius.

Now we have

$$T = 27d\cdot 43\text{ m.} = 39{,}343\text{ m.}, \quad 2\pi R = 4 \times 10^7 \text{ meters}, \quad r = 60R,$$

from which

$$a_s = \frac{2\pi \cdot 60^3 \cdot 4 \cdot 10^7 \text{ meters}}{(39{,}343 \cdot 60 \text{ sec})^2}$$

$$= 9{\cdot}74 \frac{\text{meters}}{\text{sec}^2} = 974 \frac{\text{cm.}}{\text{sec}^2}.$$

This agrees well with the value of g from terrestrial observations, while more exact calculations give a still better agreement.

The value of the Newtonian constant, γ, or the number of dynes of attraction of two masses each of one gram, one centimeter apart, is $\gamma = 6.6576.10^{-8}$.

A highly important contribution was made by d'Alembert, who made it possible to reduce every problem of dynamics to one of statics. If a system of particles be not free, they cannot move under the influence of given applied forces as they would if not constrained, but the reactions will cause them to move otherwise, as in the case of the masses in Atwood's machine. For another instance, consider two bullets fastened together by a string and thrown at random into the air. If free each would describe plane curves, namely, vertical parabolas. Under the influence of the tensions of the string which causes the constraint, they describe looped or tortuous paths. If we knew the actual paths and motions, we could find forces which would produce the same motions if the particles were free. These d'Alembert calls the effective forces and they are given by

$$X' = m\frac{d^2x}{dt^2}, \quad Y' = m\frac{d^2y}{dt^2}, \quad Z' = m\frac{d^2z}{dt^2}.$$

D'Alembert's principle states that the actual applied forces, together with the *reversed* effective sources, would form a system in equilibrium. If we express the equilibrium by means of the equation of virtual work, (25), we obtain

$$\sum_r \{(X_r - X'_r)\delta x_r + (Y_r - Y'_r)\delta y_r + (Z_r - Z_r')\delta z_r = 0,$$

or

$$(58) \quad \sum_r \left\{\left(m_r\frac{d^2x_r}{dt^2} - X_r\right)\delta x_r + \left(m_r\frac{d^2y_r}{dt^2} - Y_r\right)\delta y_r + \left(m_r\frac{d^2z_r}{dt^2} - Z_r\right)\delta z_r\right\} = 0.$$

This equation, given by Lagrange, was made by him the basis of all dynamics. Since the reactions would of themselves form a system of forces in equilibrium, they may be left out of the equation (58) of d'Alembert's Principle.

From the equation (58) we can deduce all the principles of dynamics. Suppose every particle is free, then all the virtual displacements, δx_r, δy_r, δz_r, are independent, and in

order that the equation may hold for arbitrary displacements, we must have

$$(59)\qquad m_r\frac{d^2x_r}{dt^2}=X_r,\quad m_r\frac{d^2y_r}{dt^2}=Y_r,\quad m_r\frac{d^2z_r}{dt^2}=Z_r$$

for every r. But these are Newton's equations of motion.

If the particles be free or form a rigid system, a virtual displacement will be given when δx_r, δy_r, δz_r, have the same values for all the particles. We may then remove these factors from the summation.

$$(60)\qquad \delta x\left(\sum_r m_r\frac{d^2x_r}{dt^2}-\sum_r X_r\right)+\delta y\left(\sum_r m_r\frac{d^2y_r}{dt^2}-\sum_r Y_r\right)+\delta z\left(\sum_r m_r\frac{d^2z_r}{dt^2}-\sum_r Z_r\right)=0,$$

and if δx, δy, δz, are arbitrary, this requires

$$(61)\qquad \sum_r m_r\frac{d^2x_r}{dt^2}=\sum_r X_r,\ \sum_r m_r\frac{d^2y_r}{dt^2}=\sum_r Y_r,\ \sum_r m_r\frac{d^2z_r}{dt^2}=\sum_r Z_r.$$

Now we have

$$(62)\qquad \sum_r m_r\frac{d^2x_r}{dt^2}=\frac{d^2}{dt^2}\sum_r m_rx_r=\left(\sum_r m_r\right)\frac{d^2\bar{x}}{dt^2},$$
$$\sum_r m_r\frac{d^2y_r}{dt^2}=\frac{d^2}{dt^2}\sum_r m_ry_r=\left(\sum_r m_r\right)\frac{d^2\bar{y}}{dt^2},$$
$$\sum_r m_r\frac{d^2z_r}{dt^2}=\frac{d^2}{dt^2}\sum_r m_rz_r=\left(\sum_r m_r\right)\frac{d^2\bar{z}}{dt^2},$$

where $\bar{x}$, $\bar{y}$, $\bar{z}$ are the co-ordinates of the centre of mass, which obviously coincides with what in the treatment of statics has been called the centre of gravity. We thus find that the centre of mass of a free system, or of a rigid body, moves as if all the forces of the system were applied at that point and all the mass were concentrated there. In particular if the system is exposed to no external forces, but only to its mutual actions, since these are equal and opposite in pairs, they destroy each other. Consequently the centre of mass of such a system moves uniformly in a straight line. This applies to the solar system.

Under the same conditions, a rotation about an axis is a virtual displacement. Putting as in (22) $\delta x=-y\delta\theta$, $\delta y=x\delta\theta$, $\delta z=0$, and dividing out $\delta\theta$ we have

$$(63)\qquad \sum_r m_r\left(x_r\frac{d^2y}{dt^2}-y_r\frac{d^2x}{dt^2}\right)=\sum_r(x_rY_r-y_rX_r).$$

The quantity on the right is the z-component of the resultant moment of all the impressed forces, as in (9), (23), which will be denoted by the components L, M, N.

The quantity on the left may be written

$$\frac{d}{dt}\sum_r m_r\left(x_r\frac{dy_r}{dt}-y_r\frac{dx_r}{dt}\right).$$

The quantity whose derivative appears,

$$(64)\qquad H_z=\sum_r\left(x_rm_r\frac{dy}{dt}-y_rm_r\frac{dx_r}{dt}\right)=\sum_r(x_rm_rv_{yr}-y_rm_rv_{xr}),$$

is evidently the z-component of the resultant *moment of momentum* of all of the particles of which the system is composed. We thus have the principle that if we construct a vector H having the components H_x, H_y, H_z, where

$$(64)\qquad H_x=\sum_r(y_rm_rv_{zr}-z_rm_rv_{yr}),$$
$$H_y=\sum_r(z_rm_rv_{xr}-x_rm_rv_{zr}),$$
$$H_z=\sum_r(x_rm_rv_{yr}-y_rm_rv_{xr}),$$

in virtue of the equations

$$(65)\qquad \frac{dH_x}{dt}=L,\quad \frac{dH_y}{dt}=M,\quad \frac{dH_z}{dt}=N,$$

the velocity of the extremity of the vector H, representing the moment of momentum of the system, is equal and parallel to the resultant moment of the impressed forces about the same point. This principle, with that of equations (61), suffices for the treatment of the motion of a rigid body. By putting all velocities equal to zero we obtain the conditions of equilibrium as in (9).

If in equation (58) we put for δx_r, δy_r, δz_r, the distance actually traversed by the various points in the actual motion in the interval dt,

$$\delta x_r=\frac{dx_r}{dt}dt,\quad \delta y_r=\frac{dy_r}{dt}dt,\quad \delta z_r=\frac{dz_r}{dt}dt,$$

we obtain

$$(66)\qquad \sum_r m_r\left(\frac{d^2x_r}{dt^2}\frac{dx_r}{dt}+\frac{d^2y_r}{dt^2}\frac{dy_r}{dt}+\frac{d^2z_r}{dt^2}\frac{dz_r}{dt}\right)dt-\sum_r\left(X_r\frac{dx_r}{dt}+Y_r\frac{dy_r}{dt}+Z_r\frac{dz_r}{dt}\right)dt=0,$$

and we may write the sum of terms containing the accelerations as an exact derivative,

$$\frac{d}{dt}\frac{1}{2}\sum_r m_r\left[\left(\frac{dx_r}{dt}\right)^2+\left(\frac{dy_r}{dt}\right)^2+\left(\frac{dz_r}{dt}\right)^2\right]=\frac{dT}{dt}.$$

The quantity T whose derivative appears, which is one-half the sum of the products of the mass of each particle by the square of its velocity, is the very important quantity called the *kinetic energy*. Integrating equation (66) between the limits t_0 and t_1,

$$(67)\qquad T_1-T_0=\sum_r\int_{t_0}^{t_1}(X_rdx_r+Y_rdy_r+Z_rdz_r),$$

where T_0 and T_1 denote the values of T at the respective instants t_0 and t_1.

The integral on the right is the work (14) done by all the applied forces during the motion. We thus obtain the principle that *the increase of kinetic energy of a system is equal to the work done by the forces.* Suppose now that the system be taken from one given configuration, where all the co-ordinates have given values, to a second, where they have other given values, the particles describing given paths, and they then be taken from the same initial configuration to the same terminal one, but by other paths. Two cases are to be considered. Either the work done by the forces depends upon the paths, or it is independent of the paths, depending only on the terminal configurations. If the integral

$$\int_{t_0}^{t_1}(X_rdx_r+Y_rdy_r+Z_rdz_r)$$

does not depend upon the path, it can be shown

that every component of every force is the partial derivative of a single function $-W$ of all the co-ordinates, by the corresponding co-ordinates.

$$(68) \qquad X_r = -\frac{\partial W}{\partial x_r}, \quad Y_r = -\frac{\partial W}{\partial y_r}, \quad Z_r = -\frac{\partial W}{\partial z_r}.$$

We then have

$$\sum_r \int_{t_0}^{t_1} (X_r dx_r + Y_r dy_r + Z_r dz_r) = W_0 - W_1,$$

and the equation (67) becomes

$$T_1 - T_0 = W_0 - W_1,$$

or

$$(69) \qquad T_1 + W_1 = T_0 + W_0.$$

The sum of the two functions $T + W$ is then constant during the motion. As T is called the kinetic, W is called the *potenial energy* of the system. Such systems are called *conservative systems,* and the above principle is called the principle of the *Conservation of Energy.* The motion of energy is of the greatest importance in dynamics. The principle was first used by Huygens and was generally stated by John and Daniel Bernoulli.

As an example of a conservative force we may take gravity. For a single particle we have $W = mgz$ (z being measured upward), so that the equation of energy is

$$\tfrac{1}{2}mv^2 + mgz = \text{const.} = \tfrac{1}{2}mv_0^2 + mgz_0,$$

$$v^2 - v_0^2 = 2g(z_0 - z) = 2gh.$$

Accordingly the velocity attained by a falling particle does not depend on the form of the path, but only on the height fallen. This was known to Galileo, for bodies falling along the inclined plane or the arc of a circle. All forces acting according to the Newtonian law are also conservative.

We have now stated in summary fashion the principal theorems of *Mechanics.* The scope of this article does not permit us to enter into the details of the various methods which arise for treating the more complicated problems, say of the motion of a rigid body. By means of the equations (65), however, we may form an idea of some of the properties of such motions. We have seen that the centre of mass moves as if the whole body were concentrated and all the forces applied there. To find the motion of rotation we have to investigate the moment of momentum of a rigid body. If the body rotate about an axis with angular velocity $d\theta$, we obtain the velocity of a point at a distance r from the axis by differentiating the equations $x = r\cos\theta$, $y = r\sin\theta$,

$$v_x = -r\sin\theta\frac{d\theta}{dt} = -y\frac{d\theta}{dt}, \qquad v_y = r\cos\theta\frac{d\theta}{dt} = x\frac{d\theta}{dt},$$

and the moment of momentum is

$$H_z = \sum_r m_r(x_r v_{yr} - y_r v_{xr}) = \frac{d\theta}{dt}\sum_r m_r(x_r^2 + y_r^2).$$

The quantity $K = \Sigma_r m_r(x_r^2 + y_r^2) = \Sigma_r m_r r_r^2$ is called the *moment of inertia* of the body with respect to the axis. Suppose the axis is horizontal, and the body influenced only by gravity. The resultant of the weights of all the particles of the body is a force $W = Mg$ applied at the centre of mass, which is, say, at a distance h from the axis, the plane through it and the axis making an angle θ with the vertical. Then the moment of all these forces about the axis is $N = Mgh\sin\theta$, and we have the equation of motion

$$(70) \qquad \frac{dH_z}{dt} = K\frac{d^2\theta}{dt^2} = -Mgh\sin\theta.$$

This is the same as that of a simple pendulum of length $l = K/Mh$, which is called the length of the equivalent simple pendulum. A point at a distance l from the axis and in line with it and the centre of mass is called the *centre of oscillation.* This problem of the so-called compound pendulum was solved by Huygens, who also showed that if the body be suspended from a parallel axis through the centre of oscillation the period would be the same.

If a rigid body move in any manner with one point fixed, it may be shown that its motion at any instant may be described as a rotation with a certain angular velocity about a certain axis. All the particles of the body are then moving in various directions tangent to circles with planes parallel to each other, but owing to lack of symmetry the direction of the resultant moment of momentum has no simple relation to the direction of the axis.

FIG. 25.

As the motion goes on the direction of the axis changes in the body, and so does the direction of the moment of momentum. Thus the phenomenon is a complicated one, and can be dealt with only by lengthy analysis. If, however, the axis of rotation is an axis of symmetry, as in the case of the axis of a symmetrical top, Fig. 25, it is evident that the particles may be grouped in symmetrical pairs, m_1, m_2, Fig. 26, so that the moments of momentum H_1, H_2 about the fixed point O will be symmetrical with respect to the axis, and the resultant moment will be in the direction of the axis. If then we apply to the axis a force F (Fig. 25),

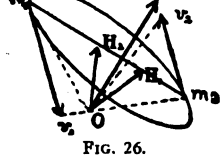

FIG. 26.

it will have a moment M (Fig. 27), perpendicular to the plane of F and the fixed point, and according to equations (65) this will be the direction in which the vector H will move toward H'. The end of the axis will, therefore, move at right angles to the direction in which it is pulled. This is the basis of the explanation of the curious phenomena of all tops and gyroscopes. In the ordinary top, the weight

acting downwards at the centre of mass produces a horizontal moment; the point of the top accordingly begins to move horizontally, causing a movement of *precession*. When the precession begins, the rotation is no longer

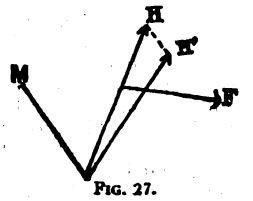

FIG. 27.

about the axis of symmetry, and the vector H no longer coincides with the geometrical axis of the top, but the end of the vector H always travels in a horizontal plane, and the axis of the top moves about it in a motion of so-called nutation. The rotary motions of the planets are explained in a similar manner. It has recently been demonstrated by Einstein that the classical, Newtonian mechanics presented here is only a first approximation to the facts. The discrepancies between the Newtonian and the Einsteinian mechanics are due to the fact that time and space, as ordinarily conceived, are not independent dimensions of being. See RELATIVITY, PRINCIPLE OF.

Bibliography.— The following treatises may be consulted for a more detailed treatment. For the whole subject: Love, 'Theoretical Mechanics'; Thomson and Tait, 'Treatise on Natural Philosophy'; Tait, 'Dynamics'; Webster, 'Dynamics'; Williamson and Tarleton, 'Dynamics'; Ziwet, 'Theoretical Mechanics.' For various parts: Mach, 'The Principles of Mechanics'; Minchin, 'Treatise on Statics'; Routh, 'Analytical Statics'; Routh, 'Dynamics of a Particle'; Routh, 'Dynamics of a System of Rigid Bodies'; Tait and Steele, 'Dynamics of a Particle.'

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MECHANICS OF DEVELOPMENT OR EVOLUTION. A term applied by German embryologists and biologists to the changes coincident with the reproduction, fertilization and later growth of organisms. In the organic world, living bodies are constantly undergoing changes of state, these changes being most conspicuous during the period of embryonic development. The changes in the conditions of life together with heredity and selection have caused the evolution of the world of plants and animals. These changes have been complex, and yet in every way have been made with exactness, order and regularity, and the larger knowledge of development mechanics has in a great measure been due to the researches of Pander, Lotz, Born, Wilson, Loew, Ryder, Wyman, Driesch and others. Probably the most noteworthy treatments, though of opposing schools, are those of Von Wilhelm Roux, 'Programm und Forschungsmethoden der Entwichlungsmechanik der Organismen leichverständlich dargestellt' (Leipzig 1897), and of Dr. Oscar Hertwig, 'Zeit- und Streitfragen der Biologie: Mechanik und Biologie' (Jena 1897). Nature does for man in the organic what he has to effect in the inorganic world, and it is only necessary that he observe these changes to be able to state a series of relations of antecedent and consequent. See LIFE; GROWTH; KINETOGENESIS.

MECHANICS' INSTITUTES. The establishment of mechanics' institutes marks the struggle of the artisan to provide for his own education. Denied a technical education, unable to take advantage of college and university education because of financial and economic stress, the artisan nevertheless demands for himself such educational opportunities as he can use during his free hours. His needs are peculiar. His range of interests is prescribed by his trade or vocation, his time is limited, his preparation is likewise limited and variable. His demands cannot be satisfied, therefore, by conventional methods and equipments. A special organization must be set up. Mechanics' institutes are a distinctive product of England, no other country having developed an equal number of such organizations. Nor are such institutions characteristic of any other national educational scheme. The reason for this is the conservatism of English universities and higher educational institutions generally. The artisan was not provided with a systematic training beyond the fundamentals of his trade as given by a more or less definite apprentice system. Industrial education and manual training were not made a part of public education until late in the 19th century. Hence the necessity for the artisan to devise a scheme for educational extension into his adult years, an education that would meet his specific needs. Birmingham and Glasgow were the pioneers in developing educational opportunities for mechanics. In Birmingham Sunday lectures in mechanics and in the physical sciences were given as early as 1789. An "Artisan Library" was maintained. Glasgow organized its Mechanics' Institute in 1823. This is probably the first use of the term. The London Mechanics' Institution was founded in the same year and was under the leadership of Dr. Birkbeck, who had been instrumental in the maintenance of the work in Birmingham. Liverpool followed with its Mechanics' and Apprentices' Library in 1825. Other cities followed and in 1839 a Metropolitan Association of Mechanic's Institutions were formed; in 1848 a similar association known as the Yorkshire Union was formed with 86 institutions as members.

The range of work became wider as the movement grew. The Manchester Mechanics' Institute announced its purpose to be "to enable artisans of whatever trade to become acquainted with such branches of science and art as are of practical application in their trade." The subjects offered either by lecture or class instruction were as follows: natural philosophy, science, natural history, literature, writing, grammar, composition, algebra, geometry, drawing, music, French, German, Latin. This is indicative of the scope of the work attempted.

The aim of the mechanics' institutes was to bring education within reach of the middle and lower classes in England. The programs show that it was an effort to give as much of the traditional content of education as these classes could assimilate. It was education given to mechanics, but much of it was not about mechanics nor yet about industry or closely re-

lated matters. Herein lies the explanation for the decline of the movement. The institutes failed to hold their clientèle as the artisans lacked the necessary educational background. But out of and on these foundations have grown the highly efficient technical schools which are in successful operation to-day.

Mechanics' institutes were also established in the United States, notably in Boston, Philadelphia, New York and Rochester, N. Y. A few are still in successful operation. It is notable that they are taking an important part in the development of vocational and industrial education (q.v.) in the United States. With free public schools, especially free State colleges and State universities, giving extensive courses in the mechanic arts and in the sciences, there is less demand for these private institutions with their special appeal to the mechanics' interests. Their function has been that of the pioneer. They have blazed the way for engineering and technical schools and are now doing the same for vocational and trade schools. See EDUCATION, INDUSTRIAL; EDUCATION, TECHNICAL; MANUAL TRAINING; COOPER UNION; VOCATIONAL EDUCATION.

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MECHANICS' LIENS, *in statute law,* a lien or claim upon real estate to secure payment for work or labor performed on, or materials furnished for, buildings or other improvements thereon; which labor or material has been furnished at the request or with the consent, express or implied, of the owner of such real estate or other property. In early English law lands were charged with liens by express agreement of the owner and were generally covered by mortgages. Courts of equity also recognized mortgage agreements. By statute other liens were created, including judgment liens and liens for taxes and assessments. In the United States the increasing number of independent contractors who constructed buildings on contract, and of dealers in building material, resulted in the enactment of numerous mechanic lien laws. Such laws have also been enacted in Canada, but not in Great Britain. The statutes hold that the value of real estate is increased by the addition of improvements and that the property should accordingly be held subject to such claims. Mechanics' liens are valid prior liens over all other claims, such as mortgages, judgments or taxes, and the term covers all claims for labor, whether skilled or unskilled, and for all building materials furnished. But liens are held against the property and not personally against the owner. The lien only attaches to the very property upon which the work was done, and has no effect on other pieces of real estate of the owner. In most States the law provides that the work to which the owner is entitled under a contract must be entirely performed before the contractor can file a lien, but where owners' payments are made in instalments, some codes permit the filing of a lien when the owner defaults in the payment of an instalment. Liens usually take precedence according to the time of their filing in the county clerk's office. In some States subcontractors, who have not had direct dealings with the owner, may nevertheless file liens against the property for the work performed by them. The statutes of mechanics' liens vary in the different States in the manner of details, time of filing, method of procedure, etc., and State statutes should be consulted. See LIEN; MORTGAGES.

MECHANICSBURG, mē-kăn'iks-bĕrg, Pa., borough, in Cumberland County, on the Cumberland Valley Railroad, eight miles west by south of Harrisburg. It was settled in 1806 and in 1828 was incorporated as a borough. It is situated in a rich agricultural region. The chief manufactures are drop forgings for automobiles and carriage hardware, spokes, wheels and wheel materials. The borough is a distributing centre for the surrounding region and a shipping point for a large quantity of agricultural products. Irving College for Young Women is located here. Pop. 4,469.

MECHANICSVILLE, Battle of (also called battle of Beaver Dam Creek). After the battle of Oak Grove (q.v.), 25 June 1862, the Army of the Potomac was thrown upon the defensive by the sudden appearance of "Stonewall" Jackson on its right. North of the Chickahominy McClellan had but one corps in position, that of Fitz-John Porter, temporarily strengthened by McCall's division of Pennsylvania reserves. McCall held the extreme right of the line at Mechanicsville and Beaver Dam Creek, with three brigades and five batteries of 26 guns. His main position was along the east bank of the creek, a tributary of the Chickahominy, and was very strong, his left resting on the Chickahominy, his right and advance extending to a body of woods near and overlooking Mechanicsville, held by a regiment and a battery. Rifle-pits had been constructed for the infantry, epaulments had been thrown up to cover the guns and a strong picket-line was in front from Mechanicsville Bridge to Meadow Bridge along the Chickahominy. A. P. Hill's Confederate division and Cobb's Legion were in plain view from the left, intrenched on the opposite side of the Chickahominy. About noon of the 26th Hill's men were seen in motion. At 12.30 the Union pickets at Meadow Bridge were driven in, and McCall formed line; Reynolds' brigade on the right, covering the crossing of the road from Mechanicsville to Bethesda Church; Seymour on the left, covering at Ellerson's Mill the crossing of the road from Mechanicsville to Gaines' Mill; and Meade's brigade, with two batteries, in reserve. A. P. Hill had 14,000 men in his division, which he had concentrated near Meadow Bridge, under orders from General Lee to co-operate with Jackson, who was marching from Ashland to turn McClellan's right. Hill sent Branch's brigade and a battery to cross the Chickahominy seven miles above Meadow Bridge and communicate with Jackson's advance, and when Jackson had crossed the Virginia Central Railroad, Branch was to cross the Chickahominy, push down the river and uncover Meadow Bridge, which Hill was to cross at once and then sweep down to Mechanicsville, uncovering in turn the Mechanicsville Bridge, which Longstreet's and D. H. Hill's divisions were to cross, when all were to push down the left bank of the Chickahominy and cut off McClellan's communications with his base at White House on the Pamunkey, and thus force him to abandon his operations against Richmond and

retreat down the Peninsula. Jackson was behind his appointed time, and it was 10 o'clock before Branch opened communication with him. Hill grew impatient as the hours went by and nothing was heard from Branch or Jackson, and at 3 P.M. put his five brigades and six batteries in motion. Field's brigade seized Meadow Bridge and crossed, closely followed by the brigades of J. R. Anderson and Archer. The brigades of Gregg and Pender then crossed and marched across the country to support the right of the attacking column. Field's advance was met by a severe artillery fire; but, forming line, with Pegram's battery in the centre, it forced the Union advance of a regiment and battery from Mechanicsville back to the main line beyond Beaver Dam Creek. It had not been General Lee's intention to attack McCall in position, but to have Jackson turn it. Jackson was not up in time; McClellan would doubtless penetrate his design and make a counter-attack against Richmond; time was everything; the day was declining, and Lee ordered A. P. Hill to attack. The brigades of Field, Archer and Anderson were ordered to advance on the Mechanicsville road against Reynolds. They were met by a withering fire of artillery and musketry and were bloodily repulsed, though one of Anderson's regiments on the left succeeded in making a temporary lodgment beyond the creek. Parts of Porter's CORPS now came up and strengthened Reynolds' right. Following the repulse on the left, Pender's brigade and Ripley's of D. H. Hill's division made a most determined attack upon Seymour at Ellerson's Mill, but a mill-race, swampy ground and other obstacles were in their way, and Seymour's direct and Reynolds' flank fire checked and then repulsed them with great loss. The attack was renewed, and a still more bloody repulse was the result, some of the regiments losing all their field officers and half their men. It was now sunset, and no further effort was made to assault the position, but the firing was kept up until 9 P.M. On the next morning McCall was ordered to fall back to Gaines' Mill (q.v.). The Union loss was 49 killed, 207 wounded and 105 missing. The Confederate loss, killed and wounded, was over 1,500; Longstreet says between 3,000 and 4,000 killed, wounded and missing, which is probably excessive. Longstreet further says: "Next to Malvern Hill, the [Confederate] sacrifice at Beaver Dam was unequaled in demoralization during the entire summer." Consult Alexander, 'Memoirs of a Confederate' (New York 1907); Ropes, 'Story of the Civil War' (ib. 1907); Steele, 'American Campaigns' (Washington 1909); 'Official Records' (Vol. XI); 'McClellan's Own Story'; Webb, 'The Peninsula'; Allan, 'History of the Army of Northern Virginia'; The Century Company's 'Battles and Leaders of the Civil War' (Vol. II).

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MECHANICVILLE, mę-kan'iks-vĭl, N. Y., village, in Saratoga County, on the Hudson River and the Champlain Canal, and on the Delaware and Hudson and Boston and Maine railroads, about 20 miles north of Albany. The water power is extensive. Power is transmitted from Mechanicville to manufacturing establishments in Schenectady. Some of the manufacturing establishments of Mechanicville are knitting mills, collar and shirt factories, mattress factories, iron bed works, sash and blind factories, paper and pulp mills and machine shops. It contains a fine city hall, a new high school and a public school library. The village owns and operates the waterworks. The commission form of government is in operation. Pop. 6,634.

MECHANISM, or the MECHANICAL THEORY, in its most general significance, means the relation of a limited number of invariable substances to each other in such a way that they vary in their relations according to invariable laws. More specifically it means the explanation of phenomena by the universal laws of matter in motion. It is closely connected with the attempt to resolve bodies into their simplest elements and to explain their qualities as due to uniform laws of connection and interaction among these elements. The mechanical theory has usually been held in connection with some form of atomism. Since the aim of this kind of explanation is to reduce qualitative determinations to quantitative and mechanical relations of elements, these elements have usually been conceived to possess only such qualities as were necessary to explain the empirical qualities, the ideal being to find a single homogeneous element possessing only the characteristics essential to corporeity. The term mechanical is also used in a looser sense, though still within the limits of the general definition given above, to describe any explanation which regards all the qualities of a body as due to the mere summation of the qualities of its parts; e.g., a mechanical theory of society.

Mechanism as a Theory of the World.— As a philosophical theory, mechanism is the attempt to regard the entire universe as a closed system of causes and effects in which every change is ultimately reducible to a change of motion. In this sense, therefore, it is practically synonymous with materialism (q.v.).

Mechanism as a Method of Explanation. — After the Middle Ages the development of the new science, at the hands of Copernicus, Kepler and Galileo (qq.v.), and many of their contemporaries, depended very largely on the application to nature of the method of mechanical explanation. Francis Bacon (1561–1626) (q.v.), by his opposition to the use of teleology in scientific explanation, did much to bring about the acceptance of mechanism, and it was firmly established as the true scientific method of dealing with nature by Descartes (1596–1650) (q.v.), who, though not an atomist, still denied to matter all but quantitative characteristics and defined the method of science as strictly mechanical. Even the physical phenomena of living bodies (everything in the world, in fact, except the *res cogitans* in man) he regarded as capable of a purely mechanical explanation. From this time on mechanism became the recognized method for natural science, and consequently it soon became an urgent philosophical problem to discover a satisfactory way of reconciling the mechanical conception of nature with a teleological and idealistic conception of the universe. Thus Leibniz (1646–1716) (q.v.), while admitting the necessity of reducing all natural phenomena to motion, held that ultimate reality consists of an infinity of centres of force (monads), which he conceives as in some sense analogous to minds. Accord-

ingly, metaphysical explanation must be in terms of teleology, though mechanism is the sole valid explanation of the phenomenal manifestation of reality in nature. A similar conception, having its historical origin in Leibniz, was held in the 19th century by Lotze (1817–81) (q.v.), who proclaims the purpose of his philosophy to be "to show how absolutely universal is the range of mechanism, and at the same time how completely subordinate the significance of the function which it has to fulfil in the structure of the world" ('Microcosmus,' Introduction). Kant also regards the mechanical categories as the sole valid means of scientific explanation. The causal category is, for him, rigorously constitutive of our experience and hence is determinant of our conception of all objects in the world of experience; teleology, on the other hand, though a necessary means of regulating our investigations of organized matter, remains a merely subjective principle which can give no insight into the origin of any being. When we deal with objects which "cannot be thought by us, as regards their possibility, according to the principle of mechanism," we may treat them "as if" they were teleologically ordered; but "nothing is gained for the theory of nature or the mechanical explanation of its phenomena by means of its effective causes, by considering them as connected according to the relation of purposes." The phenomena of the moral life, according to Kant, lie outside the realm of scientific experience and hence are not subject to mechanical explanation. Since Kant's time, many thinkers, perhaps the majority, have followed him in regarding mechanism as the ultimate principle of explanation for science; thus Helmholtz, F. A. Lange, Dubois-Reymond, Clausius, Thomson, Maxwell, etc. Wundt attempts to find for it a logical justification as the only theory which can afford an adequate conception of natural causality. On the other hand, more recent writers, especially among physicists, have taken the opposite view. According to them, the pre-eminence of mechanical explanation is merely a dogma based on its successful use in science. E. Mach, Stallo, Helm and H. Cornelius take this position. These thinkers maintain that the purpose of scientific explanation is to condense into a single compact statement (e.g., a mathematical formula) a large mass of empirical data. A scientific law is merely a short-hand statement of the facts, and its value is purely economic. So long as the mechanical theory affords useful analogues for the formulation of other phenomena, it is a valid scientific method. Whenever this ceases to be the case, mechanism must be superseded by a more economical theory. Kant's conception of mechanism as a mode of dealing with experience has been developed by contemporary English idealism. The general problem of all rational knowledge is conceived to be the construction and maintenance of a coherent and systematic experience. In all thought, therefore, there is implied a totality which constitutes the truth. But this totality manifests itself in different categories of thought and in varying degrees of perfection. "Matter and motion are the abstractions in which the sensuous world is reduced to homogeneity in order to be susceptible of quantitative treatment, and in this treatment they are able to a large extent to represent genuine and actual relations of that world" (Bosanquet, 'Logic,' Vol. I, p. 200). Mechanical explanation, therefore, is one form in which the unity of thought may be manifested; it is "that form of identity and difference in which an identity is regarded as the sum of the difference in which it is presented" (ib., p. 201). Its value for knowledge is therefore said to be instrumental or methodological, because it is a method which thought uses in its effort to construct a rational experience. It possesses ultimate truth just in proportion to the degree of rational unity which it achieves in experience as a whole.

In psychology the term mechanism is sometimes used to describe a theory which seeks to explain mental phenomena as due to the combination or interaction of simply psychic elements. This usage is an analogy with the atomic theory of matter. The classical example is Herbart (q.v.), who gave the term currency. According to his theory every representation has a constant quality and a variable force. These forces stand in relations of greater or less opposition and the whole state of consciousness is conceived as a resultant of all the forces involved in it. Consult Th. Ribot's 'German Psychology of To-day' (Eng. trans. by J. M. Baldwin, pp. 24 ff.). For mechanism in biology see MECHANISM AND VITALISM.

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MECHANISM AND VITALISM. The Newtonian mechanics has long constituted an ideal for all the natural sciences on account of the elegance of its form and the clearness of its definitions. There has consequently been a tendency to reduce biology as well as chemistry, astronomy, optics, etc., to a mechanical basis and to explain all biological phenomena in terms of motions of particles. This tendency is known as *mechanism*, and those who follow it are called *mechanists*. Now, a living oganism, even from the purely mechanical side, is of the greatest complexity and intricacy of structure. Practically all organic tissues are colloidal in nature, and the physics and chemistry of even a simple colloid are as yet very imperfectly understood. Furthermore, the most minute observable portion of living tissue is far from being a simple colloid, but manifests a distinct and highly complicated structure. As a consequence, all mechanical explanations of living processes are bound to be of an extremely sketchy nature. Now, the actions of animals and plants are subject to fairly simple descriptions in terms derived from our own consciousness. When a spider catches a fly, we seem to render that fact intelligible to ourselves by saying that it wants to eat the fly. As a consequence, our biology as it exists is permeated through and through by anthropomorphic con-

cepts, such as purpose, desire, sensation, etc. While the mechanists claim that, as far as the scientist is concerned, all the facts ordinarily described through the mediation of these concepts are susceptible to a correlation in a fashion which, though purely mechanical, is too complicated for our own human faculties to grasp, there are others, the so-called *vitalists*, who deny this possibility.

The vitalists may either discover a peculiar purposive, anthropomorphic force active in biological matters alone, as does Driesch, or they may, like Bergson, regard the purposive account of the world as everywhere prior to the mechanical account. They draw their arguments from certain processes which, like the regeneration of lost parts, or the adaptation of the individual to the environment by mutation, appear peculiarly fitted for purposive explanations involving some prevision of the future. These processes they regard as not merely non-mechanical, but counter to the current of mechanism, involving either indeterminism, or determination through factors which have no mechanical correlates.

The paucity of the fruits of purely mechanical research in biology is obvious; on the other hand, the methods of the vitalist are generally so crude and his definitions so vague that there is no great body of biological knowledge which has been gained from the vitalistic standpoint. The terminology of vitalism abounds in such expressions as *élan vital*, or "entelechny," which are only defined *per ignotius*. In short, whether a complete mechanization of biology be possible or not, biological investigation has been fertile precisely in so far as it has subjected itself to the norms, if not to the concepts, of physical science. It would consequently seem that mechanism is methodologically correct, even if it be metaphysically wrong. See also MATERIALISM; MECHANISM.

Consult Bergson, Henri, 'Creative Evolution' (New York 1911); Driesch, Hans, 'The History and Theory of Vitalism' (London 1914); Mack, Ernst, 'Popular Scientific Lectures' (Eng. trans., Chicago 1895).

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MECHANISMS, Mental, are modes of thought obtaining both in the unconscious and in conscious mental activity, the most important of which are identification, compensation, projection, introjection and rationalization. In the earliest infancy the individual gradually makes a distinction between self and external reality, tending to regard as *himself* those parts of his experience which give him pleasure and as *external* those parts which give him pain. He thus very early unconsciously identifies himself with certain portions of his environment. This unconscious habit of thought continues throughout life. All persons constantly identify themselves with persons and things surrounding them or which come within their mental purview. This has the very important result of making them regard those external persons or things as having an influence over themselves and their acts and their emotions. Thus a man who defended the actions of a celebrated physician who was condemned and executed for murdering his wife was giving, in his defense, an illustration of identification of himself with the murderer, as was shown later to some extent by his confession that he lived very unhappily with his wife and sympathized with the criminal who had succeeded in getting rid of his partner in that way. Two varieties of identification are distinguished, namely, the subjective form or introjection, and the objective or projection. In introjection the subject accepts an idea which really has an external origin, and identifies it with some portion of his own mind, as for instance when one reads a description of some disease and infers that one has that disease oneself. This is a characteristic of impressionable and hypersensitive natures who feel an excessive sympathy for other people. It leads to various forms of introversion in which the individual tends more and more to live a life within himself and to become more and more unable to achieve objective success in the world. Projection, on the other hand, is that objective form of identification which takes an idea which has had actually an internal origin and believes that it has an external origin. Examples of this mechanism in an excessive degree are found in the mental malady known as paranoia (q.v.), in which the suspicions of the individual, having a purely subjective origin, are projected upon the external social environment. The paranoiac believes that he is a great man, taking his belief from the grandiose thoughts which occur to him as a compensation [see below] for an unconscious feeling of *inferiority*, and he views external reality more and more as conspiring against him to prevent the realization of his wishes for superiority. It is true that all individuals give evidence in thought and act of both introjection and projection, but it is only when these mechanisms are unduly developed that the discrepancy between the unconscious wish and the actuality become such as to render the individual obnoxious. All normal adults identify themselves with parts of their environment to some extent, as with their possessions and with the members of their family and of their social milieu, but such identification is productive of good both in action and in thought. It should not, however, be allowed to go too far, and a rigorous critique should be exercised by comparison with real things in order to prevent excess.

Compensation is that mechanism of the unconscious which secures an activity sometimes quite the opposite from that found to be the goal of the unconscious wish. For example when a person shows an extraordinary interest in antivivisectionism or the prevention of cruelty to children or to animals, it is frequently discovered upon analysis that this form of activity is a compensation for an unconscious sadism or desire to inflict cruelty. Lynching, which ostensibly aims at the punishment of an offender, is in reality mediated through an unconscious desire to inflict cruelty or to see it inflicted. Much of the action of extravagant chivalry is also an illustration of an unconscious desire to indulge in acts of cruelty. This is an apparent contradiction, but numerous analyses have shown the truth of this statement. The fact that a conscious and an opposing unconscious wish are satisfied both at the same time makes the compensation all the more ambiguous. That is, the individual consciously believes that he is satisfying only the wish to *right* a wrong, not being conscious of the fact

that in taking especial pleasure in righting a wrong, he is unconsciously satisfying a wish to occupy his mind with the *wrong* itself. It is not known to the militant suffragette that her conscious desire to arrogate to herself the privileges of *men* is a compensation for an unconscious desire to be dominated by a *man*. Compensation is a physiological mechanism, too, by virtue of which the function of one organ, say the kidneys, is taken over at times by that of another, for instance the skin, in excreting certain waste products. An aim is sought by nature and failing in attaining this aim through one avenue, she tries another. Similarly in the mental processes, the psyche is aiming constantly at the satisfaction of desire, and if it fails to get it consciously, it will get it unconsciously by compensation, that is, the desire of which the individual is not aware, though it may be fundamental in his psyche, will nevertheless gain its satisfaction in some substitutive form, through something which symbolizes in conscious life the object of the unconscious craving. A very infantile partial trend (q.v.) of the libido, namely, the child's desire to be looked at, is gratified by the actor in a domestic performance where he may be utterly unconscious of the fact that his primary desire is to exhibit his body but unconscious only of the fact that he wishes to represent a character for the edification of the public.

Rationalization is the constant tendency on the part of all people to give an *ex post facto* reason for their thoughts or acts. This is why "a man convinced against his will is of the same opinion still." The term rationalization was introduced into analytic psychology by Dr. Ernest Jones. If a person is hypnotized and during the hypnotic sleep is told by the hypnotizer to do something when he wakes up, such for instance as putting a chair on a table, he will do so, and when he is asked to give a reason for this act, he will fabricate a wrong one, because he does not know the right cause. The cause of his act was the hypnotic suggestion, and is perfectly well known to the hypnotizer. But to the hypnotized subject the cause is unknown as it is contained in his unconscious, and, having been given to him in his unconscious state, it does not emerge into consciousness. This is paralleled by almost every instance in which a reason is given for doing anything. The entire cause in the case of some persons is, as with the hypnotized person, in the unconscious, while with the majority of people a large proportion of the causes of all their actions is in their unconscious and is unknown to them. The reasons which people then give for their actions are termed rationalizations and the tendency of all persons to feel that they have to give reasons when they are asked for them is what is meant by rationalization. See also SYMBOLISM and consult Frink, H. W., 'Morbid Fears and Compulsions' (1918) and Jones, Ernest, 'Papers on Psychoanalysis' (2d ed., 1918).

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MECHANOTHERAPY, the healing of disease by mechanical means, which includes all systems of physical therapeutics, such as massage, baths, electricity, vibration. It is really nothing more than forms of exercise adapted to the special needs of the patient. See MASSAGE and consult Grafstrom, 'Mechano-Therapy' (2d ed., Philadelphia 1904).

MECHITARISTS, měk-i-tär'ists, a sect of Armenian Christians acknowledging the authority of the Pope, but retaining their own ritual. The name originated from Mechitar Da Petro (1676–1749), who in 1701 founded a religious society at Constantinople for disseminating a knowledge of Armenian literature. They soon removed to the Morea, whence in 1715 they went to Venice, and later to the island of San Lazzaro. There are branches of the sect in Vienna and elsewhere. At Venice its printing presses have turned out the best works in Armenian literature, and a periodical which has a large circulation. Consult Boré, 'Le couvent de Saint Lazare à Venise, etc.' (Paris 1837); Scherer, 'Die Mechitaristen in Wien' (5th ed., Vienna 1892); and 'La vie du serviteur de Dieu, Mechitar' (Venice 1901).

MECHLIN, měk'lin (Dutch, měh'lĭn), or **MALINES**, mä-lēn, Belgium, a city on the Dyle, 14 miles southeast of Antwerp. The ancient walls and moat have been replaced by a wide boulevard and canal, the streets are wide and regular and it has fine squares and public buildings. It is the see of the primate of Belgium and has numerous churches. The present primate is the illustrious Cardinal Mercier (q.v.). Saint Rombold's Cathedral, a vast building covering nearly two acres, was built in 1437–52; the clock-tower, however, 324 feet high, remains unfinished; the cathedral contains Van Dyck's 'Crucifixion.' The churches of Saint John and Our Lady contain works by Rubens; the town hall dates from the 15th century; the Cloth Hall, now used as a guardhouse, from 1340, while also noteworthy are the modern archiepiscopal palace, the Beguinage and the Salm Inn (1534). The manufacture of pillow lace and of cloth, so famous in the 15th, 16th and 17th centuries, has been largely transferred to Brussels; the chief industries now are carpentry, caps and woolens, candles, starch, bells, tobacco, cabinet-making, brewing, horticulture and agriculture; extensive railway works have been established here. In 1914 the city was occupied by the Germans, who were later driven out by the garrison troops of Antwerp. The Germans retook the city after a violent bombardment, during which most of the city was laid in ruins. Pop. 59,000.

MECKLENBURG, měk'lĕn-boorg, Germany, a territory on the Baltic Sea, a former Saxon province, now divided into the grand-duchies of MECKLENBURG-SCHWERIN and MECKLENBURG-STRELITZ.

(1) Mecklenburg-Schwerin, bounded on the north by the Baltic Sea, elsewhere chiefly by Prussia and Mecklenburg-Strelitz, has an area of 5,135 square miles. The capital is Schwerin. Mecklenburg-Schwerin is watered by several rivers, most important of which are the Elbe and its tributaries, the New Elde and the Sude, on the southern border, the Warnow, the Recknitz and the Stepenitz, which flow toward the Baltic. There are many lakes and ponds, the largest of which are the Müritz See (51 square miles), the Schweriner See (23 square miles), the Kölpiner and the Plauer See. The country is generally flat, though here and there intersected by low ranges of hills, and its surface is extensively covered with wood. Near the sea

are large tracts of sand and morass. The climate, though raw, is mild and healthful; the average temperature throughout the year is 46° and the precipitation is 21 inches.

The principal industries are agriculture, dairying and stock-raising. About 50 per cent of the population are tillers of the soil. The landholders are hereditary tenants of the peasant class, title being vested in the upper classes, as the emperor, the aristocracy, clergy, etc. The chief crops are wheat, rye, oats, barley, corn, pease, beans, beets, turnips and potatoes, and tobacco is cultivated to some extent. The principal manufacturing industries are foundries, machine shops, brick yards, tanneries, paper mills, sugar refineries, breweries, distilleries, tobacco factories, etc. There is considerable commerce through Warnemünde (Rostock) and Wismar. The railway mileage is 1,094 miles. The predominating form of religion is the Lutheran. Besides the university at Rostock there are several gymnasia and numerous burgher, parochial and other schools. The two Mecklenburg duchies have a common assembly or Landesunion, consisting of the representatives of the landed aristocracy or Ritterschaft and the burgomasters of 49 towns; the tenants of the royal domains have no representation. The assembly meets once a year, alternately at Malchin and Sternberg. The executive authority in Mecklenburg-Schwerin is vested in a cabinet of four ministers; there are also a permanent committee consisting of nine members at Rostock, who represent the two estates when the assembly is not in session, and deputation and convocation diets, which may be assembled upon special occasions and for special purposes. Mecklenburg-Schwerin has two votes in the federal council and six representatives in the Reichstag, the only elective offices. Each duchy has a separate system of lower courts but they have a Supreme Court at Rostock in common. There is no general financial budget for Mecklenburg-Schwerin; there are three entirely distinct systems of finance. The budget of the first system is called the administration of the sovereign; the second, the states administration and the third the ordinary budget of the common administration. In 1913 the public debt amounted to $32,717,025. Technical education is well advanced and higher education is provided for by the University of Rostock. Pop. 639,958.

(2) Mecklenburg-Strelitz, divided by Mecklenburg-Schwerin into two large districts, the circle or lordship of Stargard, and the principality of Ratzeburg, both on the east, and on the west in several smaller districts, existing in separate patches, has an area of 1,131 square miles. Pop. 106,347, capital Neustrelitz. The country is flat and similar in physical characteristics to Schwerin. Strelitz has one joint representative chamber with Schwerin, but Ratzeburg is not included in these estates and is governed directly by the grand duke. The grand duke gave Ratzeburg a representative constitution 1869. Mecklenburg-Strelitz has one vote in the federal council of the empire and one representative in the diet. Consult Raabe, W., 'Mecklenburgische Vaterlandskunde' (3 vols., Wismar 1896).

MECKLENBURG (měk'lĕn-bĕrg) **DECLARATION,** in American history, a series of rebellious resolutions adopted 20 May 1775, at Charlotte, Mecklenburg County, N. C., by a convention held at midnight and representing each militia company in the county. The resolutions declared that the people of Mecklenburg County were free and independent of the British Crown, and not only was the general tenor that of the Declaration of Independence, but many phrases in the resolutions are word for word as they appear in that document. The minutes of the midnight meeting are said to have been destroyed by fire in 1800. Whether the Declaration of Independence followed the words of the Mecklenburg Declaration, or whether the latter, having probably been replaced from memory, was tinctured with the former, is a disputed question. In 1831, the day of 20 May was made a legal holiday in North Carolina. Consult Cooke, 'Revolutionary History of North Carolina' (1853); Draper, 'The Mecklenburg Declaration' (1874); Graham, G. W., 'The Mecklenburg Declaration of Independence, May 20 1775,' and 'Lives of its Signers' (New York 1905); Hoyt, W. M., 'The Mecklenburg Declaration of Independence' (ib., 1907); Moore, J. H., 'Defense of the Mecklenburg Declaration of Independence' (Raleigh 1908).

MECONIC ACID, an organic acid occurring in opium and having the formula $C_5HO(OH)(COOH)_2$. In preparing it, the opium is exhausted with water at 100° F., the infusion is neutralized with calcium carbonate and evaporated to a syrup, and calcium meconate is precipitated by adding a concentrated solution of calcium chloride. Two crystallizations from hot dilute hydrochloric acid follow, and the free acid is then deposited in the form of small scales, containing three molecules of water. Upon heating to 212° F. the hydrated crystals lose their water, and become white. Meconic acid is readily soluble in alcohol, but only slightly so in ether and in cold water. It has a sour taste and a pronounced acid reaction, and its solutions are turned red by ferric chloride, $FeCl_3$. Meconic acid forms numerous salts ("meconates"), as well as various organic derivatives; but none of these is of importance in the arts.

MEDAL, a piece of metal in the form of a coin, stamped with a figure or device to preserve the portrait of some eminent person, or the memory of some illustrious action or event, and not to be circulated as money. Medals belong to two periods, ancient and modern, separated by a wide interval. Early Greek and Roman medals were struck for prizes in athletic games, or in commemoration of great events. The Roman series of medals or medallions is very extensive in gold, silver and brass or copper. The gold medals begin with Constantine and continue to the fall of the empire; the silver begin under Gallienus and continue as long; the copper from Augustus to Alexander Severus.

In more modern times the art of medal-making has been brought to great perfection, and most of the principal nations have adopted the plan of preserving their history by these durable monuments. The French series is deserving of special mention as the most perfect and complete in the world. It commences under Louis XI and continues to the present date, illustrat-

ing every important event in the history of France. The English series commences under Henry VIII, but as works of art the medals have not high rank. The British battle medals, however, form an admirable series.. The Italian and German medals of modern date are very fine. The mediæval are interesting and bold in design, but rude in execution. The papal series, commencing with Paul II, are worthy of attention.

One of the earliest American medals is that presented to Gen. John Armstrong for his successful attack in 1756 on the Indians at Kittanning. Most of those struck during the Revolution were made in France. The next American medal of which there appears to be any record is that which was presented to General Gates after the surrender of Burgoyne, 17 Oct. 1777. On 25 March 1776, when news of the British evacuation of Boston reached Congress, that body resolved that its thanks be presented to the Commander-in-Chief, and that a gold medal be struck in commemoration of the event. This medal was nearly two and three-quarters inches in diameter. On one side was a profile head of Washington, with the legend in Latin: "The American Congress to George Washington, the Commander-in-Chief of its armies, the asserter of freedom." On the reverse the device showed troops advancing toward a town, others marching toward the water, ships in view, General Washington in front, mounted, with his staff, whose attention he is directing to the embarking enemy. The legend is: "The enemy for the first time put to flight." Then, too, at the time of his death, among minor honors paid to the great general's memory, was the publishing of a silver commemorative medal.

There is the record of one medal only granted by Congress in commemoration of any naval victory during the War of the Revolution, and that was a gold one presented to Paul Jones for his defeat of the British frigate *Serapis* when commanding the *Bonhomme Richard,* 23 Sept. 1779. Other gold medals were those presented to Commodore Perry and Lieutenant Jesse D. Elliot for the part which they took in the battle of Lake Erie, 8 Oct. 1812; to Captain Lawrence, who, in command of the *Hornet,* 24 Feb. 1813, captured the British brig *Peacock*; to Captain Warrington of the *Peacock* — then under the Stars and Stripes — for the capture of the *Epervier,* 20 April 1814; to Capt. Thomas Macdonough, who commanded the American squadron in Plattsburg Bay, August 1814; to Captain Decatur, who, in command of the *United States,* captured the British frigate *Macedonian,* 25 Oct. 1812; and to Captain Jones and Captain Blakely, who, when commanding the *Wasp* — the one, 12 Oct. 1812, and the other 28 June 1814 — captured respectively the *Frolic* and the *Reindeer* from the British navy.

The giving of medals went out of fashion after the second war with Great Britain, and but little was done by the government during the War of the Rebellion. Maj. Robert Anderson received two medals for his gallant defense of Fort Sumter, but one was presented by the citizens of New York and the second by the Chamber of Commerce of the same city. After the successful operations by Grant in East Tennessee and at Chattanooga, Congress voted him thanks and a gold medal with suitable emblems, devices and inscriptions. It is worthy of remark that no less than 189 medals were struck in honor of Abraham Lincoln, and later medals have been issued in memory of Garfield and McKinley, and in honor of Sampson, Schley, Dewey and others in the Spanish-American War. (See also COINAGE; NUMISMATICS; TOKEN MONEY). Consult Hawkins, 'Medallic Illustration of the History of Great Britain and Ireland' (London 1885); Loubat, J. F., 'Medallic History of the United States' (New York 1878); Leduc, 'Histoire des décorations en France' (Le Mans 1890); Hill, G. F., 'Portrait Medals of Italian Artists of the Renaissance' (New York 1912).

MEDAL OF HONOR, United States Military, an honor bestowed upon army and navy officers and men for specific services; regarded as a higher token of the war hero than the Victoria Cross of England, the medal of the Legion of Honor of France, or the Iron Cross of Germany. It is given not for the sheer performance of duty, no matter how hazardous that duty may be, but for some voluntary act of valor, beyond the bounds of mere obedience to orders. Out of the millions of men who have battled for the United States in the different wars this country has had, the vast majority, as history shows, performed their duty. Of these, however, have been about 2,000 men who have done more, who have braved dangers when they were not expected to brave them, overcome difficulties that were regarded by the rest as insurmountable, and faced death when it seemed it meant the sacrifice of their own lives. Many are the ways these medals have been won. By the Act of 12 July 1862 the United States government authorized the striking of 2,000 medals to be given to non-commissioned officers and privates for gallantry in action and soldierlike qualities. On 3 March 1863 the sum of $20,000 was appropriated for making the medals, and officers were made eligible to receive them. Medals were also authorized by Congress in recognition of acts of bravery performed (during the war with Spain in 1898) in the naval battles of Manila and Santiago, the Manila medals bearing the portrait of Admiral Dewey, and the Santiago medals a portrait of Rear-Admiral Sampson. The medal is a bronze five-pointed star within a circle of stars, suspended by a trophy of two crossed cannons surmounted by an eagle, united by a ribbon of 13 stripes of red, white and blue. Consult Rodenbough, 'Uncle Sam's Medal of Honor' (New York 1886), and 'United States Army Regulations' (latest issue).

MEDAL OF HONOR LEGION, an association of officers and enlisted men of the United States army, who were awarded medals of honor for special acts of bravery and devotion. At first limited to participants in the Civil War, it was subsequently extended to all medal holders. The association has altogether about 400 members among the army veterans and among naval veterans. The meetings are held annually.

MEDALLION, mē-dăl'yŏn. (1) The term medallion in numismatics is applied to those productions of the mint of ancient Rome, or struck in the provinces under the empire, which, if gold, exceed the *aureus* in size; if silver, the *denarius;* and if copper, the first or large brass. Medallions are not numerous. Those struck in

the Greek provinces are more common than the Roman, but of inferior workmanship. A beautiful and famous gold medallion exists of Augustus, and one of Domitian, but few, in any metal, are found prior to the reigns of Hadrian and Antoninus; those in brass are the largest, many of them being several inches in diameter, and for the most part of admirable workmanship. (See MEDAL).

(2) In architecture, an oval panel carved in bas-relief, usually carrying a head or figure. The same term is used for a color design.

MEDANO, mā-dä'nō, the Spanish name for peculiar moving sand-hills in Peru. They are seen on the plain of Islay near Arequipa, and are crescent-shaped bodies of white sand, which move across the desert in the direction of the winds which blow from sunrise to sunset. The sand composing the *medano* seems different from the desert sands over which the moving mass is blown or carried.

MEDARY, Samuel, American editor and politician: b. Montgomery Square, Montgomery County, Pa., 25 Feb. 1801; d. Columbus, Ohio, 7 Nov. 1864. In 1825 he settled at Batavia, Clermont County, Ohio, and in 1828 established the *Ohio Sun* in support of Jackson's candidacy for the presidency. He sat for Clermont County in the State house of representatives in 1834–35 and was a member of the State senate in 1835–37. In 1837 he purchased at Columbus the *Western Hemisphere,* later the *Ohio Statesman,* which he edited until 1857. In 1857–58 he was governor of Minnesota Territory and in 1858–59 of Kansas Territory. He was named Minister to Chile in 1853 but declined. He established the *Crisis* at Columbus in 1860, and was its editor until his death. He gave active aid to Morse in the promotion of the electric telegraph, was a firm supporter of the measures of Jackson and Douglas; is said to have originated the battle-cry "Fifty-four forty, or fight!" in connection with the Oregon boundary dispute, and was often called the "old wheel-horse of Democracy." There is a monument to his memory at Columbus, Ohio.

MEDEA, mẹ-dē'ą, a powerful sorceress of the Greek heroic age, daughter of Æetes, king of Colchis. By some her mother is said to have been Idyia, daughter of Oceanus; by others Hecate or Neæra. By her profound knowledge of the magical virtues of plants she practised witchcraft. She became the wife of Jason (q.v.), the leader of the Argonauts. For 10 years she lived with him after having supported him in every danger, till the charms of Glauce, or Creusa, the daughter of King Creon, kindled a new passion in him, and he discarded Medea, who brooded on revenge. With this purpose she sent the bride, as a wedding gift, a poisoned garment, also a poisoned crown of gold, which Glauce put on and died in agony. The sorceress reduced Creon's palace to ashes by a shower of fire, murdered her two children by Jason and then mounted her dragon chariot and escaped. Some say that she went to Hercules, others to Athens, to King Ægeus, by whom she had Medus. From Athens also she was banished as a sorceress. She finally returned to her home, where her son Medus reinstated her father, who had been dethroned by his brother Perses, after which she died. The story of Medea has often been a subject of tragic poetry ancient and modern. The tragedies of this name, by Æschylus and Ennius, have perished, as well as the Colchides of Sophocles. The Medeas of Euripides and Seneca are alone extant. The story has also been dramatized by Corneille and Grillparzer. Cherubini made this myth the subject of an opera. Consult Lübker, F., 'Reallexikon des plassischen Altertums' (8th ed., Leipzig 1914), and Mallinger, Léon, 'Médée étude sur la litterature comparée' (Paris 1898).

MEDEA, The, a play of jealousy and revenge, in which the interest is sustained from the beginning to the very end, and is artistically almost without a flaw, was brought out by Euripides in 431 B.C. Few tragedies of ancient or modern times are more dramatic. None exhibit the working of a fiercer and more intense passion. With the 'Hippolytus' it forms the double summit of the poet's works, and probably no Greek tragedy has been more famous in the modern world. The great enchantress, who fell in love with Jason when he came to Colchis in quest of the Golden Fleece, escapes with Jason to Greece, and lives happily with him for many years. Later Jason and his barbarian princess are obliged to flee to Corinth. In this city the scene of our play is laid. The old nurse speaks the prologue: Jason has deserted his wife for the daughter of Creon, king of Corinth. Dishonored, forsaken, the hapless woman sits brooding. The pædagogus enters and reports a conversation he has just overheard: Creon proposes to banish Medea. Medea is heard bemoaning her fate: oh, that she had never listened to the smoothing words of the deceitful Greek. Embittered, she imprecates curses on Jason and her children and prays that the whole house may be blasted to naught. Then she comes out and explains her position to the Corinthian women, who form the chorus. Creon enters and orders Medea to get her gone. She dissembles: the king is mistaken in believing that she is dangerous — she is simply hot with hate against Jason. "Let me remain — I shall yield to the stronger hand and hold my peace." The king reluctantly consents for her to remain one day. A great change comes over the woman scorned after Creon's departure: "I would not have groveled so before him except to get revenge. I shall bide my time, find first a safe refuge, then compass their destruction in secrecy by craft. Till then, my soul, sit still. By the Queen of Night that habits my hearth's dark shrine, no one shall ever vex my soul with impunity."

The chorus sing: "the old order is upturned; piety and fear, religion, justice, truth, loyalty all decline to their contraries, and naught but confusion lives." Jason appears and upbraids his wife for her froward spirit; she may rail at him, but not against the king. He had tried to appease the incensed ruler, but she persisted in her folly. But he will not desert her even in this dire extremity. "O most pernicious and perfidious man! You front me, you, the most hateful, insolent wretch on earth? But I am glad you came, for I shall tell you what you are, that you may chafe and wince.— I saved you, slaying the dragon and delivering you from death. I abandoned my home and followed you. Yet now you forsake me, the mother of your children. A loyal

spouse I have in you! I, a poor lorn woman, with her two babes, a fine reproach for our newly wedded prince!» Jason feels that he must be a skilful pilot to run before the wind of her loud words; but he declares that she received more than she gave, for she lives in a good Greek land, where law and justice reign — she is no longer an obscure barbarian. He had her welfare at heart when he contracted the new alliance. Women are so unreasoning that they know not where their fortunes lie. Jason withdraws and the chorus sing a song on the power of love. King Ægeus of Athens enters. He promises to protect Medea, if she comes to his city seeking refuge. Then she sends for Jason and asks his forgiveness for the rash words spoken in angry mood: «Ho, children, come forth and welcome your father with me.» But the thought of their impending death, when she beholds her babes, is too much even for Medea's iron courage. The tears force themselves to her pitying eyes. In explanation of her weakness she tells Jason that she is a woman, naturally born to tears, prone to weep, subject to fears: her heart melted at the thought of reconciliation. Jason has naught but praise for her altered mood; may his children grow to manhood triumphant o'er his foes. Medea weeps. Jason asks her why she turns her face away and hears not with joy his benisons. «'Tis nothing — I bare them, bred them, loved them, and when you prayed that they might live, I wondered whether this would come to pass.» She begs Jason to intercede for her children and allow them to remain in Corinth — she will send his bride royal gifts. The children carry the presents in a casket to the palace. The chorus sing an ode and the pædagogus enters to inform Medea that the children may remain. «Be of good comfort, thy children will yet bring thee back home.» «Nay, I shall first send others home. Alas! O children, you have a home, but I go to another land, just when I begin to feel that I am blest in you. Out upon my daring! 'Twas all for naught I toiled for you, my children. Ah, the fond hopes that your dear hands would minister to my wants and when I die put the shroud around me. Oh, why do you look at me thus? My heart is unequal to the task. My babes' bright morning faces unnerve my arm. I *cannot* do it. I will take my children with me. Why, to wring their father's heart, give my own a double pain? But am I to be mocked? Shall I let my foes go unpunished? I *must* do it. Out upon my cowardice! Go in, children. Nay, my heart, let them live; spare the tender babes, my unblown flowers, my life, my joy, my all the world. No, by the avenging deities, I will not give up my children to my foes. But I must see them before I go. O my darlings! O sweet mouth and form and face, sweet kiss, sweet embrace! O balmy breath and tender touch of your delicate cheeks! Go in, go in. I can look no longer, I faint.» The chorus sing an ode on the comparative benefits of having children and having no children. A messenger enters: «when your children entered the palace we were all glad. The rumor spread that you were reconciled.» One kissed the hands of the children, the other their flaxen hair. The princess sat with fond look on Jason; but when she espied the pair, she pulled down her veil and turned away in scorn. Jason entreated her to allay her wrath: «Accept these gifts and ask your father to remit the doom of exile, for my sake.» And when she saw the splendid gifts, she granted her lord's desire. Then she took up the robe — after they had gone — and tried it on. The golden crown she placed upon her head and arranged her hair before a mirror. Then she rose and walked about the room, stepping lightly with delicate foot and glancing oft toward the lowest folds around her ankle. Suddenly a ghastly spectacle presented itself. A pallor spread o'er her face. Back she tottered all a-tremble, and barely reached her couch before she fell, frothing foam around her lips, her eyeballs rolling wildly. One servant darted to her father's chamber, another flew to call the bridegroom. The hapless girl lay full a minute speechless. Then she roused and gave forth a scream, for a double agony had charged upon her: from the inclusive verge of golden metal around her brow a marvelous stream of fire shot forth, while the robes began to eat her delicate flesh. Up she started and sped across the room, a pillar of fire, shaking hair and head in vain endeavor to cast off the crown. But firm it held. Whene'er she shook her locks the flames started up twice as high and fierce. O'erwhelmed she sank upon the floor, past recognition save to a parent's eye: the clear calm look was gone, the comely features marred, drops of intermingling fire and blood dripped from her head, while gobbets and flakes of flesh dropped from her bones, like tears of resin from the pine, as those unseen jaws of the poisonous drug fed on her form. All feared to touch the corpse. Suddenly her father entered. He knelt and clasped her in his arms: «Oh, my poor child, what god brought thee to this cruel death?» At last he stayed his tears and tried to raise his old bent form, but the robes did cling to him as the ivy to the laurel. He writhed upon his knees and tried to wrench himself away, but only pulled the flesh from off his bones. At last the ill-starred sire gave up the ghost. Now their corpses lie side by side, a spectacle to draw tears of pity from the eye. Medea informs the chorus that she must slay her children and hasten away: «Now, my heart, put on thy armor for the deed. Shrink not. Think not on the happy days agone. For this one brief day forget thy children — e'en if thou dost slay them, they are most dear, and I the most unhappy woman in the world.» Medea enters the house and soon the screams of the children are heard within. Jason enters and asks for Medea; he feels anxious for his children — the king's relatives may do them hurt. «Wretched man, your children are dead, slain by their mother's hand.» Jason is overwhelmed. He orders the gates to be unbarred. Medea appears aloft in a chariot. Jason asks for the bodies; but she refuses to give them up: she will take them and bury them herself, that her foes may not demolish the grave. She intends to go to the land of Erechtheus to live with Ægeus. She prophesies that Jason will die most miserably, struck on the head by a piece of fallen timber from the Argo. She soars away, and Jason calls on Zeus to witness the treatment he has received at the hands of the tigress. Thus the play, in which we see the perfection of Euripides' art,

ends. The fury of her vengeance is as the love of Phædra in the 'Hippolytus'; but instead of overwhelming her soul, it excites to action, arms it against the deepest instincts of mother-love and makes it triumph over everything in a kind of grandiose and savage egoism. The more impetuous the fury, the more pathetic the struggle of feminine instincts. In no other play is there anything more characteristically Euripidean than Medea's celebrated monologue. Next to the human passions it is the natural affections, the tenderness of parents for their children, the love of brothers and sisters, of husband and wife, that Euripides portrays best.

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MEDELLIN, mā-dĕl-yēn', Colombia, a city, the capital of the department of Antioquia, and an episcopal see, picturesquely situated in a mountain valley 4,850 feet above sea-level on the Porce, an affluent of the Canca, 150 miles northwest of Bogotá. It was founded in 1674 and has a cathedral, college, seminary, technical school, mint, hospital and other public buildings. The development of the gold and silver mines in the region has contributed largely to its modern progress. It has manufactures of pottery, porcelain ware, cloth, candies, cigarettes, clocks, shoes, paper and jewelry and has a considerable trade, exporting gold, silver, coffee and hides. Pop. 70,547. Consult 'Censo general de la república de Colombia' (Bogotá 1912).

MEDFIELD, Mass., town, in Norfolk County, 20 miles south of Boston; on the New York, New Haven and Hartford Railroad. The town is the seat of Medford State Hospital. Bricks and straw hats are manufactured. Hannah Adams, the historian, was born in Medfield. Pop. 3,466.

MEDFORD, mĕd'fŏrd, Mass., city, in Middlesex County; on the Mystic River and on the Boston and Maine Railroad, five miles northwest of Boston. The area is about 10 square miles. It was founded in 1630 by people from Salem who called the place Meadford. In 1892 it was chartered as a city, having within its limits the villages of South Medford, West Medford, Hillside, Glenwood and Wellington. It is a residential suburb of Boston, but it has some important industrial interests, chief of which are the manufacturing of machinery, cotton goods, dyes, chemicals, carriages, brick and novelties. It is the seat of Tufts College (q.v.), and has the city and the college libraries. The Cradock House, built in 1634, is one of the oldest, if not the oldest building in the United States which retains its original form. The city has four large and several small parks, many miles of boulevard (Metropolitan Parkways) and includes many acres of State reservation (called Middlesex Falls) where game is protected and the public allowed to enjoy the natural beauties of the country. "The Royal House" is also located in this city and is of historic (Colonial) interest and is preserved by the Royal House Association, it is of the finest type of Colonial design. Oak Grove, the largest of its three cemeteries, has an area of 34 acres. The charter granted in 1892 is still in force and provides for the administration of the municipality by a mayor, who holds office two years, and a board of aldermen composed of 21 members. The administrative officials are appointed by the mayor or elected by the council. The board of education is chosen by popular vote. Pop. 23,150. Consult Usher, 'History of the Town of Medford, Mass.'

MEDFORD, Ore., city, in Jackson County; on the Pacific and Eastern, the Southern Pacific and the Rogue River Valley railroads, five miles east of Jacksonville. In the neighborhood are Crater Lake, National Park and Sugar Pine forests. The city has a high school, post-office building, Carnegie Library, Sacred Heart Hospital, Saint Mary's Academy and a station of the United States Weather Bureau. It has a large trade in apples and pears, for which it is an important shipping point. The municipality owns the water-supply system which was constructed at an expenditure of $350,000. Pop. 12,490.

MEDFORD, Wis., city, county-seat of Taylor County; on the Black River and on the Wisconsin Central Railroad; about 60 miles northeast of Eau Claire. It is in an agricultural and lumbering region. The chief manufactures are cheese, foundry products, lumber and leather. It has considerable trade in lumber, leather and cheese. Pop. 1,846.

MEDHURST, mĕd'hėrst, **Walter Henry,** English oriental scholar and missionary: b. London, 1796; d. there, 24 Jan. 1857. He was educated for the ministry and in 1816 made a missionary tour through India and Malacca, establishing himself in 1822 in the island of Java, where he remained eight years. During this interval and for several years afterward he pursued his missionary labors also in Borneo and on the coasts of China. In 1843 he settled in Shanghai and subsequently passed six years in the interior of China. He was an intelligent student of the languages and literatures of eastern Asia, being well versed in the Chinese, Japanese, Javanese and other dialects, besides Dutch, French and English, in all of which he wrote. Beside a Chinese version of the Bible, he published 'Chinese Repository' (20 vols., 1838–51); 'Chinese and English Dictionary' (1842–43); 'English and Chinese Dictionary' (1847–48); 'English and Japanese Vocabulary' (1830); 'Dictionary of the Hokkien Dialect' (1832–39); 'Translation of a Comparative Vocabulary of the Languages of China, Corea and Japan' (1835); 'Notes on Chinese Grammar' (1842); 'Chinese Dialogues' (1844); 'China in its State and Prospects' (1838); 'Dissertation on the Theology of the Chinese' (1847); etc.

MEDIA, mē'di-ą, Asia, an ancient kingdom and country of considerable extent, now comprised in the provinces of northwest Persia. It was originally inhabited by a Turanian race, who are called Medes by ancient writers; but this name properly belongs to an Aryan race, who had spread themselves widely in the high regions of Western Asia and ultimately established their ascendency in Media. They have been traced both by Persian and Indian traditions to the countries beyond the Indus. The history of Media is involved in considerable obscurity, but careful modern investigations have made the main outlines fairly clear. The Medes are first mentioned in connection with some of the kings of Assyria from the 9th

century B.C. Rammân-nirari II of Assyria, who reigned about 810 B.C., led expeditions into Media and in 713 the great King Sargon conquered the country and made the Median princes tributary to the Assyrian monarchy. According to the Assyrian inscriptions, one of the Median rulers named Dajaukku was carried off as a prisoner in 715 B.C.; this Dajaukku is the same as the Deioces who, according to Herodotus, founded the Median kingdom on an independent basis and fixed his capital at Ecbatana (now Hamadan). Deioces was followed by three kings in succession, bearing the names (in Greek) of Phraortes, Cyaxares and Astyages. Phraortes, to whom the Greek historian assigns a reign of 22 years (647–625 B.C.), began the extension of the Median empire by the subjugation of the mountainous region of Persis, to the southeast of Media. He then conquered other parts of Asia, and at length ventured to take the aggressive against the Assyrians and attack Nineveh. In this attempt he failed and lost his life. Cyaxares succeeded him on the Median throne, and during a reign of 40 years raised his kingdom to the greatest power and importance it was destined to achieve. He thoroughly reorganized the army and advanced against Nineveh. He gained several successes, but before he could take the Assyrian capital he had to return to defend his kingdom against the inroads of Scythians. At first the Scythians carried all before them and became virtually masters of Media, but Cyaxares temporarily secured his position by negotiating with them, and finally slew all their chiefs when they were overpowered by wine at a feast. Thus rid of Scythian authority, Cyaxares again advanced against the Assyrians. In conjunction with Nabopolassar, founder of the Neo-Babylonian empire, he captured Nineveh about the year 606 B.C. After this event the Assyrian dominions were partitioned between the two conquerors, the northern parts falling to Media and the southern portions to Nabopolassar. Nebuchadnezzar, son and successor of Nabopolassar, married a daughter of Cyaxares. Cyaxares carried his arms into Asia Minor and waged war for five years against Alyattes, king of Lydia. On 28 May 585, the Median and Lydian forces were engaged in battle when a total eclipse of the sun took place and struck terror into the soldiers on both sides. This event disposed both sides to enter into peace negotiations, which were successfully carried through by the agency of Nebuchadnezzar and Syennesis, prince of Cilicia. Cyaxares probably died very shortly after this event, and left to his successor a greatly extended empire. Astyages was the last independent king of Media, and from 550 B.C., when he was conquered by Cyrus the Persian, Media formed part of the Persian empire. See PERSIA and consult Delattre, A. L., 'Le peuple et l'empire des mèdes jusqu'à la fin du règne de Cyaxare' (Brussels 1883); Oppert, Jules, 'Le peuple et la langue des Mèdes' (Paris 1879); Prášek, 'Medien und das Haus des Kyaxares' (Berlin 1890); id., 'Geschichte der meder und Perser bis zur makedonischen Eroberung' (Gotha 1906); Ragozin, Z. A., 'Media, Babylon and Persia' (New York 1888).

MEDIA, Pa., borough, county-seat of Delaware County; on the Philadelphia, Baltimore and Washington Railroad, about 15 miles west of Philadelphia. It is a well-built, well-kept residential suburb of Philadelphia, and is situated in a fertile agricultural region. It is the headquarters for the Delaware County Institute of Science, established in 1833. The Institute has a library of about 5,500 volumes, and the borough library has about 3,500 volumes. The street-lighting plant and the waterworks are owned and operated by the borough. The borough was incorporated in 1850; its government is vested in a burgess and council. Pop. 3,562.

MEDIAL MORAINE. See MORAINE.

MEDIATION, *in international law,* is the friendly intercession of a third power or powers with a view to bringing about the settlement of a controversy between two or more states, to avert threatened hostilities between them or to bring to a close a war in which they are engaged. Most writers on international law make a distinction between "good offices" and "mediation." The employment of good offices by a third power consists in the tendering of friendly advice or the offering of suggestions to the disputing parties with a view to bringing about the settlement of a dispute or the conclusion of peace, if they are engaged in war. A government which tenders its good offices is understood to be willing to suggest a compromise as a common basis of agreement between the contending parties, to arrange preliminaries for the negotiation of a treaty of peace and to do anything else that may serve the parties in settling their controversy or in ending their hostilities.

Mediation, on the other hand, has more of the character of friendly intervention. A mediator assumes the rôle not merely of adviser or conciliator but takes the part of a middleman,—usually the leading part,—in the conduct of the negotiations between the disputants. He is not, however, a judge, for mediation is not arbitration, nor is he an advocate for either side but, to use the language of Sir James Mackintosh, he is "a common friend, who counsels both parties with a weight proportioned to their belief in his integrity and their respect for his power." With a view to encouraging a more frequent recourse to mediation as a means of settling international controversies and in order to define the rôle of the mediator the Hague Peace Conferences of 1899 and 1907 adopted the following rules which were embodied in a convention which was ratified by practically all the powers of the world.

"In case of serious disagreement or dispute, before an appeal to arms, the Contracting Powers agree to have recourse, as far as circumstances allow, to the good offices or mediation of one or more friendly Powers (Art. 2).

"Independently of this recourse, the Contracting Powers deem it expedient *and desirable* (the italicized words were added in 1907) that one or more Powers, strangers to the dispute, should, on their own initiative and as far as circumstances may allow, offer their good offices or mediation to the States at variance.

"Powers, strangers to the dispute, have the right to offer good offices or mediation, even during the course of hostilities.

"The exercise of this right can never be regarded by either of the parties at variance as an unfriendly act (Art. 3).

"The part of the mediator consists in reconciling the opposing claims and appeasing the feelings of resentment which may have arisen between the States at variance (Art. 4).

"The duties of the mediator are at an end when once it is declared, either by one of the contending parties, or by the mediator himself, that the means of reconciliation proposed by him are not accepted (Art. 5).

"Good offices and mediation, undertaken at the request of the contending parties or on the initiative of Powers strangers to the dispute, have exclusively the character of advice, and never have binding force (Art. 6).

"The acceptance of mediation cannot, in default of agreement to the contrary, have the effect of interrupting, delaying or hindering mobilization or other measures of preparation for war.

"If mediation takes place after the commencement of hostilities, the military operations in progress are not interrupted, in default of agreement to the contrary (Art. 7)."

It will be seen that the tender of good offices or mediation by third powers prior to or during hostilities is declared to be a legal right, though not an obligation. The Convention, however, imposes on the disputants an obligation to have recourse to this mode of settling their controversies *so far as circumstances allow.* Each disputant is therefore the judge as to whether the circumstances in a particular case create an obligation to accept the offer tendered. At the outbreak of the European War the President of the United States made known his willingness to serve as a mediator whenever he should receive assurances that an offer would be acceptable by the warring powers. Again in 1916 when war between the United States and Mexico seemed imminent the governments of several of the Latin American republics made known their willingness to offer their good offices in bringing about a settlement of the dispute but the American government declared that the circumstances were not such as to make recourse to this form of sentiment expedient. The express declaration of The Hague Convention that the exercise of the right of mediation by third powers shall never be regarded by either of the disputing parties as an unfriendly act was designed to remove all possibility that an offer of mediation might be construed as an act of gratuitous interference rather than the act of a disinterested friend of both parties. The rôle of the mediator is defined in article 4 as that of reconciliation and article 5 lays down the circumstances when h's mission is terminated. Article 6 which declared that mediation has no binding effect on the parties but is entirely advisory in character removes the possibility of further misunderstanding concerning its purpose and effect.

The historical instances of recourse to good offices and mediation are numerous. A few of these may be mentioned as illustrations. During the war of 1812 between Great Britain and the United States, the Tsar of Russia offered to act as a mediator with a view to bringing about a termination of hostilities. The offer was accepted by the government of the United States and to avoid delays plenipotentiaries were at once appointed by the President to conclude a treaty of peace but the offer was refused by the British government and nothing further came of the Russian proposal.

Early in 1861 several Latin American republics tendered their good offices to avert the civil war then imminent; after the outbreak of hostilities the British and French governments through their ministers at Washington expressed a willingness "to undertake the kindly duty of mediation" if the President should desire it. President Lincoln expressed appreciation for "this generous and friendly demonstration" but stated "that we cannot solicit or accept mediation from any, even the most friendly quarter." On various occasions during wars in South and Central America the President of the United States tendered his good offices to bring about the adjustment of difficulties or to terminate hostilities already existing. One of the most remarkable of such examples of mediation on the part of the United States was that which was begun in 1866 and concluded in 1872 for the purpose of terminating the war between Spain on the one hand, and the allied republics of Peru, Chili, Bolivia and Ecuador on the other. During the Franco-German War of 1870–71 France requested the United States "to join other powers" in an effort to bring about peace. President Grant replied that he anxiously desired to see the war ended and peace restored and that he would be glad to use his efforts in bringing about peace if Germany also desired the employment of his good offices. At the same time the French government was informed that it was the uniform policy of the United States not to act jointly with European powers in interference in European questions. During the Chino-Japanese War of 1894 the government of the United States made known to both belligerents its willingness "to contribute its kindly offices toward the restoration of peace" but when an inquiry was made asking whether the United States would be willing to join England, Germany, France and Russia in an intervention between China and Japan the President replied that the United States could not join the powers mentioned in such an intervention. During the Boer War of 1899–1902 the government of the United States alone of all the governments approached by the South African republics tendered its good offices but the offer was not acceptable to the government of Great Britain.

A remarkable recent example of the employment of good offices by the President of the United States to bring about the termination of war was the intervention of President Roosevelt in 1905 which resulted in the conclusion of peace between Japan and Russia. On 8 June 1905 the President caused identical notes to be sent to the governments of both belligerents expressing his wish that "the terrible and lamentable conflict now being waged" might be brought to an end and urging them "not only for their own sakes but in the interest of the whole civilized world to open direct negotiations with one another." He also expressed his entire willingness to do what he properly could if the two powers felt that his services would be of any aid in arranging the preliminaries as to the time and place of meeting of the plenipotentiaries which they might appoint. The suggestion of the President was promptly acted upon and plenipotentiaries were appointed to negotiate

a treaty of peace. They met at Portsmouth, New Hampshire, and a treaty of peace was signed on 23 Sept. 1905.

A still more recent example of successful mediation was that of 1914, which resulted in the temporary termination of an existing conflict between the United States and Mexico. On 25 April, the diplomatic representatives of Brazil, Argentina and Chile addressed a communication to the Secretary of State tendering the good offices of their governments for "the peaceful and friendly settlement" of the controversy. The offer was promptly accepted both by the President of the United States and General Huerta, President of Mexico, and both parties agreed to a mutual suspension of hostilities at the request of the mediators.

At the suggestion of the mediators commissioners representing both parties were appointed and they met at Niagara Falls, Ontario, in May 1914. The mediating plenipotentiaries in turn presided over the conferences. On 24 June a protocol embodying the terms of agreement was signed and it was duly ratified by both governments. See also ARBITRATION, INTERNATIONAL.

Bibliography.— In addition to the general treatises on International Law (bibliography q.v.) see especially Hershey, 'Essentials of International Public Law' (pp. 322–324: excellent bibliography on p. 342; New York 1912); Holls, 'The Peace Conference at The Hague' (pp. 176–203; New York 1900); Higgins, 'The Two Hague Peace Conferences' (pp. 167 ff; Cambridge 1909); Hull, 'The Two Hague Conferences' (pp. 267–276; Boston 1908); Moore, 'Digest of International Law' (Vol. VII, Secs. 1065–1068; Washington 1906).

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MEDICAGO, genus of leguminous plants common throughout the greater part of the globe and including such forage plants as alfalfa, medic and bur and mail clovers. Some species are annual, others perennial. In all there are about 50 species, of which about six are native to the United States. These include *M. sativa, M. lupulina, M. denticulata, M. Arabica.* In general the perennial species have violet flowers, the annuals small bright yellow flowers. The pods are single-seeded, curved and spineless in some, while in others it is spirally twisted, has spines on the edges and contains several seeds. Medicago sativa is the most important species, since it includes the valuable alfalfa and lucerne.

MEDICAL ASSOCIATION, American. See AMERICAN MEDICAL ASSOCIATION.

MEDICAL CODE, a set of regulations adopted by a medical association outlining the conduct of members of the profession. The various codes prohibit advertising in public prints, as well as the endorsement of proprietary or secret remedies. The ethics of both "regular" and homœopathic schools define the relations of patient and physician and of attending and consulting physician, and provide that a physician shall attend the immediate family of a brother physician without charge, except when unusual labor, expense or exposure is involved. The medical code in this country was founded on the English code of medical ethics prepared by Thomas Percival in 1803. In 1847 the American Medical Association adopted a general code which superseded codes existing in several States, and which was unopposed till 1882. In the latter year a majority of the members of the New York County Medical Society voted to disobey the provision of the code which forbade them to consult with any but "regular" physicians, claiming the right to consult with any physicians that the legislature of each State decided to be legally qualified. Similar action was taken by a majority of the members of the New York Academy of Medicine. This antagonism affected the whole profession in this country, and the immediate result was the formation of New York County and State associations, whose delegates were received by the American Medical Association to the exclusion of those from the old societies. In 1903 steps were taken to heal their differences and unite the rivals into one body, with the code so modified in effect as to allow individual liberty in the matter of consultation. Consult Flint, 'Medical Ethics and Etiquette' (New York 1883) and 'Principles of Medical Ethics' (Chicago 1912), the official work of the American Medical Association.

MEDICAL COLLEGES FOR WOMEN. See EDUCATION, PROFESSIONAL; MEDICAL EDUCATION IN THE UNITED STATES.

MEDICAL CORPS. The Medical Department includes the Medical Corps, Dental Corps, Medical Reserve Corps, Hospital Corps and Nurse Corps. The Medical Corps consists of one surgeon-general, with rank of brigadier-general, who is chief of the medical department, 14 colonels, 24 lieutenant-colonels, 105 majors and 300 captains or first lieutenants, who have rank, pay and allowances of officers of corresponding grades in the cavalry and of the service. An applicant for appointment in the medical corps of the army must be between 22 and 30 years of age, at the time of taking the preliminary examination, must be a citizen of the United States, must have a satisfactory general education, must be a graduate of a reputable medical school legally authorized to confer the degree of doctor of medicine, and must have had at least one year's hospital training, including practical experience in the practice of medicine, surgery and obstetrics. The appointments are made by the President, upon the recommendation of the surgeon-general, after the applicants have passed the prescribed examination, consisting of two parts — a preliminary examination, and a final or qualifying examination, with a course of instruction at the Army Medical School intervening. Qualified applicants are appointed to the medical reserve corps with the rank of first lieutenant, and upon pledging themselves to accept a commission in the medical corps, if found qualified in the final examination, and to serve at least five years thereunder, unless sooner discharged, are ordered to the Army Medical School, Washington, D. C., for instruction as candidates for admission to the medical corps of the army; if, however, a greater number of applicants qualify than can be accommodated at the School, the requisite number are selected according to their relative standing as marked by the Army Medical Board. Graduate candi-

dates who are found physically qualified and who obtain a general average of 80 per cent in their preliminary professional examination, in their course at the Army Medical School, in their clinical examination and in their general aptitude, are eligible for appointment in the medical corps. Eligible candidates may, if they so desire, take a special examination in ancient or modern languages, higher mathematics, or scientific branches other than medical. Proficiency therein is rated by the board conformably to instructions from the surgeon-general. The relative standing for appointment of eligible candidates is determined by the total number of points obtained in the preliminary professional examination, in the School, in the clinical examination, in general aptitude, and in the special examination, if one is taken. See ARMY MEDICAL SCHOOL; HOSPITAL CORPS; MEDICAL ORGANIZATION IN THE ARMY.

MEDICAL EDUCATION, Colleges and Schools, Legal Supervision, etc. Before the establishment of medical schools in this country medical students either went abroad to study or served an apprenticeship with some practising physician. The latter custom was common in view of the expense incident to work abroad, and continued till very recently. As a rule the apprentice had little opportunity for study, but was forced to depend on what he could absorb by contact with his preceptor. The physicians of the 17th and 18th centuries who had studied abroad were usually classical students and in their preliminary training set an example that it would have been wise to follow. The first public lectures on anatomy before a class of students in this country are said to have been delivered by Dr. William Hunter of Newport, R. I., in 1752. It seems, however, that Dr. Giles Firmin as early as 1647 delivered readings on human osteology in New England; that Dr. Thomas Cadwallader of Philadelphia gave instruction to students in anatomy between 1745 and 1751; and that Drs. John Bard and Peter Middleton dissected the human body in New York City in 1750 for purposes of medical instruction. 1762 Dr. William Shippen of Philadelphia gave a course of lectures on anatomy, illustrated by actual dissections. These lectures were continued till the organization of the Medical College of Philadelphia (now the medical department of the University of Pennsylvania) in 1765. Dissections were rarely performed prior to 1760 and even autopsies were seldom permitted. At the time of the American Revolution, with a population of 3,000,000, there were probably about 3,500 physicians in the colonies, of whom it is estimated that not more than 400 had received medical degrees. In New England the clergyman was often the only available physician. Two medical schools were organized in the colonies, the Medical College of Philadelphia (now a department of the University of Pennsylvania) in 1765, and the medical department of King's (now Columbia) College, in 1768. The first medical degree conferred in this country, that of bachelor of medicine, was granted to 10 men by the Medical College of Philadelphia in 1768. The degree of doctor of medicine was first conferred in 1770 by the medical school of King's College on two students who had taken the bachelor's degree in 1769. Fifty-one medical degrees had been conferred by these institutions before 1776, when operations were suspended by the war. In the colonial period two medical societies (the State Medical Society of New Jersey, in 1766, and the Delaware State Medical Society, in 1776) and one permanent general hospital were organized. Harvard University Medical School was organized in 1782, Dartmouth Medical College in 1797, the School of Medicine of the University of Maryland and the College of Physicians and Surgeons of New York in 1807. In 1813 the medical department of Columbia College was finally discontinued; the College of Physicians and Surgeons took its place in 1860. Of the 148 medical schools now existing in the United States and registered by the University of the State of New York three were established between 1765 and 1800, 12 between 1801 and 1825, 19 between 1826 and 1850, 29 between 1851 and 1875, 80 between 1876 and 1900, 5 between 1901 and 1904.

At the time of the organization of the early medical schools the practice of obstetrics was relegated as a rule to ignorant midwives; physiology, histology, organic chemistry, pathology, and surgery, as now recognized, were hardly known. The schools at first conferred the degree of bachelor of medicine on those who had studied two years with a preceptor and attended one course of lectures, the degree of doctor of medicine after three years of study and two courses of lectures. The bachelor's degree was abandoned in 1813. At first the Medical College of Philadelphia required for admission some knowledge of Greek and Latin, physics, natural history and botany, but the requirement was abandoned about the time of the reorganization of the University of Pennsylvania in 1792. For a century there were as a rule practically no requirements in preliminary general education for admission to medical schools, and even to-day this is their greatest defect.

In 1839 the New York State Medical Society resolved that teaching and licensing ought to be separated as far as possible. Further discussion of this question led to a convention of delegates from all medical schools and societies in the United States, held in New York in 1846; from it sprang the American Medical Association. This national organization, thoroughly representative in character, gave a new impetus to medical societies. The following societies have exercised an important influence in promoting higher standards: Association of American Medical Colleges (1890); American Institute of Homœopathy (1844); National Confederation of Eclectic Medical Colleges (1871); Southern Medical College Association (1892). These prescribe for admission to medical schools a preliminary general education equivalent to one year in a high school. All prescribe four courses of lectures in different years as a condition for an M.D. degree, though they give an allowance of one year to graduates of reputable literary colleges and of other professional schools. All tend to improve facilities for teaching, dissections and clinics. The schools registered by these societies are 72, 19, 7 and 13 respectively.

In 1859 the Chicago Medical College, now the medical department of Northwestern University, was established to test the practicability of a thorough graded system of instruction. Students were divided into three classes, and each class was examined at the close of the

year. Each of the three courses was six months in duration. Attendance on hospital clinical instruction and practical work in the chemical, anatomic and microscopic, or histologic laboratories were required for graduation. In 1871 the Harvard Medical School adopted a similar plan. The Syracuse Medical School followed, and to-day the graded system of consecutive lectures is the rule. In 1896 President Eliot wrote substantially as follows: Within 25 years the whole method of teaching medicine has been revolutionized throughout the United States. The old medical teaching was largely exposition; it gave information at long range about things and processes which were not within reach or sight at the moment. The main means of instruction were lectures, surgical exhibitions in large rooms, appropriately called theatres, rude dissecting rooms with scanty supervision, and clinical visits in large groups. The lectures were repeated year after year with little change, and no graded course was laid down. There was little opportunity for laboratory work. The new medical education aims at imparting manual and ocular skill, and cultivating the mental powers of close attention through prolonged investigations at close quarters with the facts and of just reasoning on the evidence. The subjects of instruction are arranged, as at the Harvard Medical School, in a carefully graded course, which carries the student forward in an orderly and logical way from year to year. Laboratory work in anatomy, medical chemistry, physiology, histology, embryology, pathology and bacteriology demands a large part of the student's attention. In clinical teaching, also, the change is great. Formerly a large group of students accompanied a visiting physician on his rounds, and saw what they could under very disadvantageous conditions. Now instruction has become, in many clinical departments, absolutely individual, the instructor dealing with one student at a time, and personally showing him how to see, hear and touch for himself in all sorts of difficult observation and manipulation. Much instruction is given to small groups of students, three or four at a time — no more than can actually see and touch for themselves.

In 1918 there were, excluding graduate schools, 95 medical schools in the United States with 13,630 students. The growth in medical students in 32 years up to 1910 was 333 per cent. In the last 15 years, however, there has been a radical change in medical education in the United States which has had the effect, as will be shown in the following table, of improving the quality of the education, while at the same time reducing the number of those granted medical degrees. Acting upon the recommendation of the American Medical Association, a committee has made a division of medical schools into three classes, A, B and C, the first containing those medical schools which fulfilled the highest requirements. The annexed table shows the results of the reconstruction which followed the classification:

Year	Colleges	Students	Women	Graduates	Women
1904.....	160	28,142	1,129	5,747	.....
1914.....	102	16,502	631	3,594	.....
1915.....	96	14,891	592	3,536	.....
1916.....	95	14,022	566	3,578	134
1917.....	96	13,764	610	3,379	153
1918.....	95	13,630	581	2,807	106

While the actual number of physicians graduated is half that of 1904, the number per thousand of population is still twice as great as it is in Europe. The diminution in number of medical students was not affected by the European War nor was the actual number of medical students and teachers affected by the selective draft, for the Medical Officers' Reserve Corps and the Enlisted Medical Reserve Corps provided against that contingency.

Class A colleges require a four-year high school course and two years of work in a college of arts and sciences approved by the council on education of the American Medical Association. The council also specifies what is required in the studies both in high school and college, and also what is to be expected of the medical schools themselves, both in supervision, equipment, teachers, clinical facilities [including, for instance, daily dispensary cases, at least six maternity cases for each senior student and 30 necropsies for each senior class of 100 students or less], medical library, museum, dissect material, etc. In 1918 there were 69 medical colleges of Class A in the United States and two in Canada.

Medical schools of Class B are those which under the present organization give promise of being made acceptable by general improvements. Of these there are 14 in the United States and six in Canada. Class C contains those which require complete reorganization, do not keep satisfactory records, or enforce entrance requirements or give a major portion of their instruction after 4 P.M., or are privately owned and conducted for profit. Of these there are 12 in the United States.

The comparative value of the work done now and 14 years ago is realized when it is known that in 1904 only 2.5 per cent of medical schools required college work as an entrance requirement, while in 1918 92.2 per cent did, and that in 1904 only 6.2 per cent of the medical students of the country were in the high grade medical schools, while in 1918 there were 95.3 per cent in the better schools, and that in 1904 but 6.4 per cent of the graduates in medicine came from the high grade colleges, while in 1918 the latter graduated 90.3 per cent.

In 1915 a national board of medical examiners was inaugurated with funds from the Carnegie Foundation. The board consists of six representatives from the government [two from the army, two from the navy and two from the public health service], three members of State licensing boards and seven other physicians appointed at large.

Of the 82 medical colleges in the United States in 1914–15 the most highly endowed had an income of $411,570, and the lowest $6,080.

About 1903 a rapid improvement in medical education began in the United States, resulting in a very great decrease in the number of medical colleges and it was thought that a dearth of physicians would follow. Fears were also expressed that the medical education, the cost of which was thus greatly increased, would be the privilege of the rich, and that it would undemocratically exclude the poor boy, a fear which has not been justified. Apprehensions were also felt that the raising of the standard of medical education would have the effect of decreasing the supply of physicians for

rural communities. This, however, has been obviated by the improvement of facilities in communication — automobiles, better roads, etc.

Out of 90 medical schools, 60 are now coeducational, although 16 out of the medical colleges admitting women have no women students. Out of seven medical schools for negroes, in 1910 only two were efficient.

More attention should be paid in the United States to instruction in hygiene and state medicine. In Great Britain no one can be appointed a medical officer unless he has a special diploma in public health. In this country little opportunity is afforded for general or special sanitary work on broad lines. This subject is now under discussion and doubtless progressive States will soon provide places where medical officers of health or other persons engaged in sanitary work can obtain practical and scientific training. The scientific investigations which would be made in the laboratories of such schools would be of great value to the public.

The earliest law relating exclusively to physicians was passed by Virginia in 1639, but like the later act of 1736 it was designed mainly to regulate their fees. The act of 1736 made concessions to physicians who held university degrees. In only two of the 13 colonies were well-considered laws enacted to define the qualifications of physicians. The general assembly of New York in 1760 decreed that no person should practise as physician or surgeon in the city of New York till examined in physic and surgery and admitted by one of his majesty's council, the judges of the supreme court, the king's attorney-general and the mayor of the city of New York. Such candidates as were approved received certificates conferring the right to practise throughout the whole province, and a penalty of £5 was prescribed for all violations of this law. A similar act was passed by the general assembly of New Jersey in 1772. In 1840 laws had been enacted by the legislatures of nearly all the States to protect citizens from the impositions of quacks. Between 1840 and 1850, however, most of these laws were either repealed or not enforced as a result of the cry that restrictions against unlicensed practitioners were designed only to create a monopoly.

State Supervision.— Careful attention needs to be given to the difference between a license and a degree, the one carrying with it the right to assume a title which is evidence of scholastic ability, the other the right to enter on the practice of a profession or a pursuit, both emanating from the same authority, the State, either directly or through intervening mediums. As foreigners are often puzzled to account for the diversity in our legislation, the fact is again emphasized that all matters of internal police control are left exclusively to the several States, and that national laws regulating professional practice cannot be enacted. Hence the laws of the United States will be silent concerning licenses and degrees except in so far as they may apply to the District of Columbia and certain recent political dependencies.

Licensing.— The requirements for admission to practise a profession in the 54 political divisions of the United States vary as greatly in the various professions as the political divisions differ in area, extent, population and importance. However, two general items appear in full or in part in the various statutory requirements for licensing; namely, (1) the general preliminary education requirements; (2) the professional preparation. The general preliminary are given uniformly under the synopsis of requirements.

Supervision.— In medicine all political divisions except Alaska now have examining and licensing boards. In some States the stringent laws against non-medical practitioners are enforced; in others quackery receives such legal protection that any person may treat "the sick or suffering by mental or spiritual means without the use of any drug or material remedy." This is due largely to the fact that so many statutes lack specific definitions as to what constitutes the practice of medicine, and without these definitions the conviction of such practitioners cannot be secured through the courts. There is much misunderstanding in this country regarding the duty of the State in relation to the health of the people. It does not consist in discriminating between schools or systems of medicine, but in requiring without prejudice or partiality of all who seek a license to practise for gain on the lives of fellow beings a minimum preliminary and professional training.

Medical Sects.—As commonly understood, regular physicians have no distinctive theory or practice; homœopaths treat diseases with drugs that excite in healthy persons symptoms similar to the morbid condition treated; eclectics make use of what they regard as specific remedies, chiefly botanic; physiomedicalists use only botanical remedies, discarding those which are poisonous. In practice these distinctions are not always observed. The following political divisions specify homœopaths, eclectics or osteopaths as constituting part of their examining boards or have other than regulars on them: Arizona, Arkansas, California, Colorado, Georgia, Hawaii, Idaho, Illinois, Indian Territory, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Nebraska, Nevada, New Jersey, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Washington, Wisconsin, Wyoming.

Philippines and Porto Rico have examining boards, the former of three appointed by the director of health for the Philippines, the latter of five appointed by the governor.

The following have separate examining boards for each recognized school of medicine: Arkansas, Connecticut, Delaware, District of Columbia, Florida, Louisiana, Maryland.

Midwifery.— Special fees for certificates of registration as midwives are required in California, Illinois, Iowa and Texas. In the following political divisions the provisions of the medical practice acts do not apply to women engaged in the practice of midwifery: Arkansas, Colorado, Florida, Georgia, Idaho, Kentucky, Louisiana, Maryland, Mississippi, Montana, New Mexico, North Carolina, South Carolina, Tennessee, Washington. In other political divisions, though there are some special provisions for certain localities, the general acts regulating the practice of medicine make no reference whatever to the practice of midwifery by women. It would seem, therefore, that these laws restrict the practice of midwifery to licensed physicians. Practically the conditions

in political divisions where the laws seem to restrict the practice of midwifery to licensed physicians are little better than in political divisions where the practice of midwifery by women without a license is authorized by statute. There will probably be little change for the better till the midwife receives legal recognition, and the practice of midwifery is regulated by definite statutory provisions.

The following States have reciprocity clauses in the law, but they are operative in few cases only, namely: Alabama, Arizona, Arkansas, California, Delaware, District of Columbia, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Michigan, Minnesota, Mississippi, Missouri, Nebraska, Nevada, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, West Virginia, Wisconsin, Wyoming.

The law provides for a preliminary education in all the political divisions except the Canal Zone, the District of Columbia, Hawaii, Massachusetts, Porto Rico and Wyoming.

The law provides for four years of high school in all political divisions except the Canal Zone, the District of Columbia, Idaho, Illinois, Massachusetts, Nebraska, Philippine Islands, Porto Rico, South Carolina and Wyoming, and for an academic college course in the following States, the number of years of such course required being given in parentheses after each: Alabama (2), Alaska (2), Arizona (2), Arkansas (2), California (1), Colorado (2), Connecticut (1), Florida (2), Illinois (1), Indiana (2), Iowa (2), Kansas (2), Kentucky (1), Louisiana (2), Maryland (2), Michigan (2), Minnesota (2), Mississippi (2), Montana (2), New Hampshire (2), New Jersey (2), New Mexico (2), New York (2), North Carolina (1), North Dakota (2), Oklahoma (2), Pennsylvania (1), Rhode Island (2), South Carolina (2), South Dakota (2), Tennessee (1), Texas (1), Utah (1), Vermont (2), Virginia (2), Washington (2), West Virginia (1), Wisconsin (2). A four years medical course is required in all the political divisions except the Canal Zone, the District of Columbia, Idaho, Massachusetts, the Philippines, Porto Rico, West Virginia and Wyoming. The number of hours of the medical course is specified as 3,000 in Colorado, and in Indiana and New Mexico, 3,200 in Illinois, 3,600 in Michigan, North Dakota, Texas and Vermont, 3,744 in Connecticut and 4,000 in California and 5,120 in Georgia.

Registration of Nurses.— See NURSE, TRAINED.

Dentistry.— See DENTISTRY.

Revised by SMITH ELY JELLIFFE, M.D.

MEDICAL EDUCATION IN THE UNITED STATES. In the colonies until about the middle of the 18th century there was no formal medical teaching. The apprentice system prevailed and young men took service with a physician and after some years went into practice for themselves. Usually this was not far from their preceptor and they could recur to him for consultation. Sons of the better-to-do colonists desirous of studying medicine crossed to Europe and received the advantage of medical training in Edinburgh, London, Paris or the Netherlands. Considering the long, difficult, dangerous voyage, the surprise is how many young Colonials secured a European medical education. Manifestly medicine was taken very seriously. The preliminary education was excellent and the medical training thorough. Dr. Morton ('History of Pennsylvania Hospital') does not hesitate to say: "We find that the professional men of the seventeenth and eighteenth centuries were generally much better educated than most of their successors of the present time. Almost without exception they were classical scholars, their graduating theses must be written in Latin."

The ideals in medical education were high. Dr. Thomas Bond's essay on 'The Utility of Clinical Lectures' (Philadelphia 1766) insists that the student "must Join Examples with Study before he can be sufficiently qualified to prescribe for the sick, for Language and Books alone can never give him Adequate Ideas of Diseases, and the best methods of Treating them." Bond argued that clinical teaching was absolutely necessary and even suggested that the teaching should be by what we call the ward class method with questions to bring out the knowledge of the disease and parts affected. He even recognized and proclaimed that the only policy that would lead to real advance in medicine was to follow up clinical observation in fatal cases by a post mortem and acknowledge mistakes in the hope to be able to avoid them in other cases. His words deserve to be publicly posted in every hospital and medical school of the country. "If the Disease baffles the power of Art and the Patient falls a Sacrifice to it, he then brings his Knowledge to the Test, and fixes Honour or discredit on his Reputation by exposing all the Morbid parts to View, and Demonstrates by what means it produced Death, and if perchance he finds something unexpected, which Betrays an Error in Judgment, he like a great and good man immediately acknowledges the mistake, and, for the benefit of survivors, points out other methods by which it might have been more happily treated."

About 1750 there are indications of waking up to the need of formal medical teaching. William Hunter, a relative of John Hunter of London in Rhode Island, Cadwalader in Philadelphia, and John Bard and Peter Middleton in New York did some anatomical teaching with dissections in this decade. In 1762 Dr. William Shippen, Jr., recently returned from London and Edinburgh, commenced a course of anatomical lectures with dissections at his father's residence in Philadelphia and this was attended by 12 students. This led to the organization of our first medical school as the Medical Department of the Philadelphia College in 1765. Shippen's principal auxiliary was Dr. John Morgan, who had been with him in London and Edinburgh, where they agreed to found a medical school in America. The second medical school was the Medical Department of King's College, New York, established in 1768. New York anticipated Philadelphia in the giving of the degree of Doctor in Medicine, the first being conferred on Robert Tucker in 1770. Philadelphia gave the first Bachelor in Medicine in 1768, but did not confer its first degree of Doctor in Medicine until June 1771. Though medical teaching had not been organized physicians abounded. It was

calculated just before the Revolution that there were some 3,500 physicians practising in the Colonies, of whom less than 400 had degrees. New York City, containing about 10,000 inhabitants, "could boast of more than forty gentlemen of the faculty, the greatest part of whom were mere pretenders to a profession of which they were entirely ignorant." (*Independent Reflector,* New York 1753).

Medical education received an almost complete setback everywhere throughout the Colonies by the Revolution, though in New York the practice of the surgeons who accompanied the British army proved instructive for the physicians who remained in the city, and courses in anatomy and some other medical subjects were given. Immediately after the Revolution steps were taken to restore the medical schools, Philadelphia indeed granting degrees at a commencement held June 1780, but personal and professional jealousies led to trouble about the charter of the college of Philadelphia and it was not until this was reorganized that the medical schools settled to work. Over 100 medical students were in attendance there in 1790. Medical teaching in New York suffered from a similar friction of personalities, but it lasted much longer. The Medical Department of King's College, changed after the Revolution to Columbia, was reorganized, but there was a hitch with the educational authorities of the State. An independent medical school was organized mainly through the influence of Dr. Nicholas Romayne and when this was refused recognition by the Regents he appealed to Queen's College (now Rutgers), at New Brunswick, N. J., for authority to confer degrees. This appeal to outside institutions came to be a favorite device of medical faculties throughout the country who had severed their connection with regularly incorporated medical institutions. No less than three times in the first half century Rutgers was thus appealed to, again in 1811 and 1826, and then a Geneva Medical Faculty was organized in New York City, until the practice was declared illegal.

After the Revolution other medical schools soon began to make their appearance. Harvard organized its medical faculty in 1783. Dartmouth established a medical department in 1797. The medical department of the University of Maryland in Baltimore was founded in 1807 and continued under that name though there was no university, and that of Yale University in 1810. Unfortunately anatomical teaching was very much hampered by popular prejudice. There was no legislation permitting the use of or providing bodies for dissection purposes. The bodies of those killed in duels were by law devoted to anatomical purposes, but resurrectionism had to supply the rest. As a result of popular suspicions there were attacks on dissecting rooms in many places. New York had its Doctors' Riot in 1789, Philadelphia, Baltimore, New Haven and Saint Louis had theirs much later, well on in the 19th century, the last actually as late as 1844. This was not a mediæval reversion as it is often called, for dissection had been very freely permitted in many places, in the Middle Ages, but a modern intolerance not unlike that which now hampers animal experimentation in this country.

The early medical schools in this country, as pointed out by Dr. Nathan S. Davis, although originating in different States wholly independent of each other and in direct rivalry for patronage, were remarkably similar in their organization and requirements. At first the number of professors in each school was small and the college term eight or nine months. The bachelor's degree in medicine was conferred after three years of study with a preceptor followed by one college term, and the doctor's degree after one or two added years of practice and a second course of college attendance. The degree of Bachelor of Medicine was abandoned by the College of Philadelphia in 1789, by the University of Pennsylvania in 1791 and by all the medical colleges in this country in 1813.

Medical schools soon began to multiply. In 1810 there were the six schools already mentioned. In the 30 years down to 1840, 26 medical colleges were added. They were in the order of their foundation. The College of Physicians and Surgeons of the Western District of the State of New York at Fairfield, Herkimer County, founded in 1812. Though in rural surroundings this did excellent work, had some noteworthy men on its faculty and up to 1840 about 3,000 students on its rolls. In 1817 Transylvania University, Lexington, Ky., finally succeeded in organizing a medical department. There had been chairs of medicine before. Samuel Brown, M.D., was appointed in 1799 to the professorship of anatomy, surgery and chemistry. In 1801 Frederick Ridgley, M.D., was elected professor of medicine. In 1805 James Fishback, M.D., was appointed to the chair of theory and practice. Twenty students attended the first full course of medical lectures in 1817–18. One of them received the degree of M.D., the first degree conferred west of the mountains. In 1818 the Castleton Medical School, afterward named the Vermont Academy of Medicine, was founded, the degree of Doctor of Medicine being conferred under the authority of Middlebury College until 1827, after which it was conferred directly by the medical faculty under its amended charter.

Dr. Daniel Drake resigned from Transylvania University in 1818 and organized the Medical College of Ohio at Cincinnati which held its first course of lectures in 1820. Altogether he held 11 chairs at six different medical schools at various times. The Medical School of Maine was organized in 1820 also as a department of Bowdoin College at Brunswick with Dr. Nathan Smith as the faculty. In 1821 a medical school developed at Brown University, Providence, but did not continue long. The Medical School of the University of Vermont was organized at Burlington in 1822. In 1823 The Berkshire Medical Institution was organized at Pittsfield, Mass., under the charter of Williams College. In 1824 the Medical College of South Carolina was organized at Charleston. In 1825 the medical department of Columbian College, District of Columbia, was organized. This school suspended 1834–35 but resumed in the latter year under the name of the National Medical College, now as the medical department of Columbian University. In 1825 Jefferson Medical College, Philadelphia, was chartered. The charter was granted to Dr. Barton in 1819 after an unsuccessful attempt in 1816. Jefferson owes its name to its connection with Jefferson College, Cannons-

burg, Pa., through which its degrees were granted. In 1825 the medical department of the University of Virginia, charter 1819, was organized. In 1826 the Medical School of the Valley of Virginia, familiarly called The Winchester Medical College, was organized at Winchester, Va. Both of these Virginia colleges prosposed to have terms of nine months instead of the shorter terms in vogue and the method of teaching was by recitations and demonstrations as in other departments of scientific and literary study and not merely by lectures. About the middle of the 19th century the University of Virginia was graduating men after two courses of four and a half months each given in the same calendar year, but its examination standards were high and its graduates were taking the best places in the army and navy service. In 1827 the Washington Medical College, so-called because its degrees for the first six years were conferred by Washington College, Pennsylvania, was organized in Baltimore. Afterward a charter was granted by Maryland. In 1831 the Medical College of Georgia was chartered and the first course of instruction given the following year. An Academy of Medicine preliminary to this had been organized in 1827 at Augusta by Dr. Milton M. Anthony, the founder of the *Southern Medical and Surgical Journal*, the first medical periodical published in the South. It was from him that came the suggestion of a convention of the faculties of the medical colleges of the United States for the regulation of medical education and the improvement of the professional status of physicians. The movement thus initiated ripened into the organization of the American Medical Association. After this the medical schools multiplied rapidly. In 1834 the Medical School of Willoughby University, Willoughby, Lake County, Ohio, was chartered and its first course of instruction commenced in 1835. In 1835 the medical institute at Geneva College at Geneva, N. Y., the medical department of Cincinnati College at Cincinnati, Ohio; the Vermont Medical School at Woodstock, Vt., and the medical department of the University of Louisiana at New Orleans were chartered by the respective legislatures. In 1837 the medical departments of the University of Louisville, Ky., and of the University of the City of New York were organized, and in 1838 the medical department of Hampden Sydney College at Richmond and in 1839 the Albany Medical College at Albany, N. Y., and the medical department of the Pennsylvania College at Philadelphia. Philadelphia continued to be for long as it had been from the beginning of the nation's history the principal centre for medical education. It was our largest city in the early days and New York's development was hampered by professional bickerings.

In the 35 years following down to the completion of the first hundred years of our history in 1876, 47 new medical schools were created, not including five or six abortive attempts so transient as to leave a record difficult to trace. This made 80 altogether established during the first 100 years, 16 of which had been discontinued, leaving 64 medical colleges in active operation in the United States. Of these Maine had two; New Hampshire one; Vermont three; Massachusetts one; Connecticut one; New York nine; Pennsylvania four; Maryland three; Virginia two; South Carolina one; Georgia three; Alabama one; Louisiana two; Texas one; Tennessee one; Kentucky three; Missouri three; California two; Oregon one; Iowa two; Illinois three; Indiana three; Ohio seven; Michigan two; and the District of Columbia three; leaving 13 States without any medical college. Of these, four, two in New York City, one in Philadelphia and one in Chicago, were devoted to the education of women in medicine. The whole number of students attending the five medical colleges in 1810, for Yale though chartered was not yet receiving students, was about 650, of whom about 100 were graduated that year. The population of the United States was about 7,250,000. In 1840, with the population two and a half times as numerous the medical students numbered 2,500, nearly four times as many, and about 800 graduated that year, eight times as many. In 1875–76 the population of the United States was over 40,000,000. It had multiplied once more two and a half times, but the medical students now numbered 6,650, having again increased faster than the population, and that year 2,200 were graduated. With this great increase of medical colleges far beyond the medical needs of the population, the inevitable struggle for existence led to the lowering of standards. The temptation to concentrate the teaching into as brief a space as possible, partly because of competition for students but mainly to secure more profit for and less call upon the time of professors who were engaged in active practice, gradually compressed the time required for study. At the same time preliminary requirements lessened and anyone who could write his name, and he did not have to write it very plainly, could take up the study of medicine. The preceptor was practically superseded and the college terms shortened to four months each with the lectures not graded, the students listening to the same course two years in succession. The degeneration of medical education was brought about by the faculty using the medical schools for money-making purposes, neglecting scientific development. Even when the medical schools bore the names of well-known universities, as Harvard, Pennsylvania or Columbia, the university administration had practically nothing to do with the medical school curriculum or management and the fees were divided among the historic septenate of professors who became firmly entrenched everywhere and refused to permit of reforms until their hands were actually forced by certain reforming elements, mainly younger members of the medical profession.

There were vigorous protests against this unfortunate degradation of medical education which all could not but acknowledge and the American Medical Association was organized on the initiative of the New York State Medical Society with one of its main purposes the reform of medical education. An attempt was made to sidetrack the organizing convention by the delegates from the faculty of the Medical Department of New York University in whose halls the preliminary meeting was held. This failed and the national organization became a fact, but was able to accomplish little in the reform of medical education for a generation. Numerous discussions were of no avail. All were ready to admit that medical students should

have better preliminary education and that the lecture courses should be graded and that there should be a systematic division of the branches taught into groups appropriate for each year of study, and that there should be at least three terms of six or better still eight or nine months, each year. The faculty of each school frankly acknowledged the defects of the system in vogue, but "each waited for the other to move first lest by placing higher requirements upon the time and resources of the student it should cause its own halls to be deserted for those of its less exacting neighbor" (Davis). Some very praiseworthy attempts were made, however, to get away from the current unfortunate state of affairs. The New York Medical College was established in 1850 with a three-year graded course and the beginnings of clinical instruction. Unfortunately the Civil War proved fatal to it, but not before it had demonstrated the possibility of raising standards in medical education. In 1859 the Chicago Medical College was organized for the express purpose of testing the practicability of establishing a school with a thoroughly graded and consecutive system of instruction. In 1871 Harvard through the influence of President Eliot adopted a fully graded system of instruction, dividing her classes and extending the courses throughout the collegiate year. The new medical school of Syracuse University adopted the same policy about the same time.

In the 35 years after 1876 the number of medical schools doubled. The great majority of the new schools were of the same low standards as so many of their precedessors and indeed were founded with the idea not of fostering medicine but of producing revenue for the professors directly or indirectly. In the meantime in 1878 Dr. Francis Delafield established the first laboratory in this country in connection with the College of Physicians and Surgeons in New York. Later that same year Dr. William H. Welch opened the pathological laboratory of Bellevue. By degrees the better schools followed these examples and many other schools found themselves compelled to take up this development of medical education or lose in attendance. It was not until 1893 that a definite advance in medical education was made by the foundation of Johns Hopkins Medical School, Baltimore. This required a bachelor's degree from every student and required four years medical study. The better known schools were now stimulated to follow the example of Hopkins. Above all the special feature of clinical instruction worked out there gradually spread to the great benefit of medical education.

At the beginning of the 20th century the Council on Education of the American Medical Association began its work of registering medical schools after examination according to the grades which they deserved. In order to secure a class A rating the medical school had to have six full time professors, at least $100,000 investment, be provided with laboratories properly equipped, require four years of medical study and at least one year of preliminary college work. It was not long then before the number of medical colleges began to drop off. At the end of the first decade of the century the investigation of medical education in the United States by the Carnegie Foundation for the Advancement of Teaching revealed the defects in many existing schools and called attention to what should be the absolute requirements for medical teaching in our day.

As a result we have nearly 100 fewer medical schools, but most of them doing serious work and 10,000 fewer medical students getting a better education. The medical schools which bear the names of universities are now actually under a university administration as a rule. Increased interest in medical education has brought about the enactment of a legal regulation in many States requiring a fifth year of preparation for the practice of medicine which is to be passed in a hospital. The entrance requirements are constantly growing higher and now two years of college work are required as a preliminary to medical study in most places and a number of schools have adopted or are about to adopt the bachelor's degree as a prerequisite. Curiously enough this modern standard is nearly a replica of the old mediæval requirement that there should be three years of preliminary study at the university before taking up medicine, four years at medicine and then a year of practice with a physician before the medical neophyte might practice for himself. Fortunately our scientific developments in medical education were completed just in time to enable us to be independent of foreign medical teaching during the war and the magnificent development of American surgery put us in a position to offer excellent opportunities for the higher study of medical and surgical problems from a thoroughly scientific standpoint to students from Europe who after the war will find it impossible to go on with university studies under favorable circumstances over there because of the destruction wrought by the war and the sad gaps in teaching staffs due to war losses involving so many of the progressive younger men.

Medical Education of Women.— The development of medical education for women in America gave back to the world the opportunity for feminine medical study which had been freely granted in the Middle Ages and then with so many other privileges was denied in modern times. The first woman student of medicine was Dr. Elizabeth Blackwell who after being refused permission to study at most of the medical colleges in the country finally secured the privilege at Geneva, N. Y., when the faculty feeling sure that her application would be rejected put it before the students and they voted unanimously to allow it. She was graduated in 1849. Her sister Emily was refused two years later at Geneva and Rush Medical College, Chicago, was censured by the State Medical Society for receiving her for a term. She was graduated at Western Reserve, Cleveland. The women resolved to found medical colleges of their own. The first of these the Women's Medical College of Pennsylvania was founded in 1850. It had a quasi predecessor in the Gregory School of Medicine established to train women as midwives, founded in Boston in 1848 and lasting until 1874. The Woman's College of the New York Infirmary was opened in 1865 and closed in 1899 when Cornell opened its medical course to women students. The Women's Medical College of Baltimore was founded in 1882, that of Cincinnati in 1886 and that of Kansas City in 1895.

The University of California was a pioneer

in opening its courses to women in 1869 and was followed in this policy by all the universities of Western States. This development also included medicine so that the special need of medical colleges for women ceased in the West. When Johns Hopkins, Baltimore, opened its medical school in 1893 women were accorded the same privileges as men. Gradually prejudices disappeared and other medical schools opened their doors to women, but it was not until the great war brought home the need for physicians during and after the war that Harvard and Columbia removed the restrictions against women in their medical schools. No barriers to the medical education of women in the United States either in undergraduate or post-graduate work will remain after the war.

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JAMES J. WALSH, M.D.

MEDICAL ELECTRICITY. See ELECTROTHERAPEUTICS.

MEDICAL JOURNALISM. One of the earliest newspapers on record, the *Gazette de France,* was issued by a physician, Renaudot (Paris 1631). He had been appointed Commissioner-General of the Poor of France when poverty was rife, just after the religious wars, and created a Bureau of Addresses where those out of work might learn of chances for employment. He established the *Gazette* to give publicity to his scheme for bringing employers and employees together. The *Gazette* was a quarto sheet, printed in four columns on one side. Medical matters were not treated directly in the *Gazette,* but its purpose was the prevention of disease and suffering by lessening poverty. With the origin of scientific societies in Italy at the time of the Renaissance, these published journals which sometimes contained articles of medical interest. The first journal paying considerable attention to medicine was *Le Journal des Scavans.* This was published every Monday for three months at Paris, at the beginning of 1665, the next year it continued longer, and then every two weeks rather regularly. It lasted some 10 years, and altogether some 700 pages were printed. Early issues, contained reviews of Willis' 'Cerebri Anatome,' and Steno's 'De Musculis et Glandulis,' and other medical reviews of current interest. The German Society of Naturalist Physicians (Gesellschaft Naturforschender Aerzte), founded in 1652, began to publish in 1670, after coming under Imperial protection, its 'Transactions' monthly under the name *Ephemeridæ.* A more purely medical periodical was the *Acta Medica Hafiensia,* edited by Thomas Bartholin at Copenhagen in 1671. The Royal Society chartered by Charles II began to publish its well-known philosophical 'Transactions' in 1665. Included among its publications were the works of Malpighi and Leeuwenhoek in the 17th century and those of Galvani in the 18th.

All these were in Latin. The first medical periodical in the vernacular was the *Nouvelles Découvertes sur toutes les Parties de la Médecine,* issued monthly (Paris 1679–81). It was published by Nicholas de Blagny, a somewhat irregular medical practitioner of the time who realized the value of publicity. He met with decided opposition from the medical profession, who deprecated not only his methods but above all the publication of medical matters in the language of the people. He waked the French medical profession, however, to the value of a medical publication and not long after, a *Journal de Médecine* was published by the Abbé de la Roque and continued by Claude Brunet, who established a monthly, *Progrès de la Médecine* (1695–1709). French medical journalism then went to sleep, to use the expressive phrase of Südhoff, for some 50 years. Formal German medical journalism began with the *Acta Medicorum Berolinensium,* founded in 1717. This appeared twice a year at first, and then annually until 1730. In 1717, there began at Leipzig a quarterly publication called the *Collection of Natural History and Medical Information.* This continued for many years. The second half of the 18th century saw a thorough waking up to the advantage of medical journalism. At Hamburg in 1759 the weekly, *Der Artz,* began. In various German cities, a series of medical Bibliotheks, that is, regularly issued reviews of medical books, made their appearance. In 1767, the German medical journal, *Neue Arzneien* (New Remedies) was founded. Most of these journals lasted only a few years until their founder became occupied with other things or his enthusiasm evaporated.

Eighteenth century medical journalism or its equivalent, at the time, consisted to a great extent of the transactions of various medical societies. A number of very important contributions to medicine were published originally in these and they have a distinct bibliographic value. Südhoff suggests that the material for the cultural history of medicine in this century lies buried in the files of its forgotten medical periodicals. These were very numerous and Garrison has given a check list in chronological order of some hundred of them.

Toward the end of the 18th century, the special journals of the scientific departments of medicine began to make their appearance. Probably the most important of these was

Reil's *Archiv für die Physiologie* (1795), which was the incentive for the foundation of Johannes Müller's *Archiv für Anatomie, Physiologie und wissenschaftliche médicin* (Berlin and Leipzig, 1834–57), continued by Reichert and Du Bois Reymond and still published at the present time. Siebold's *Lucina* (Leipzig 1802–11), Langenbeck's *Bibliothek für die Chirurgie* (Göttingen 1805–13), Grafe's and Walther's *Journal der Chirurgie und Augen-Heilkunde* (Berlin 1820–50), Magendie's *Journal de physiologie expérimentale* (Paris 1821–31), Malgaigne's *Journal de Chirurgie* (Paris 1843–46), *Bulletin de la Société anatomique de Paris* (founded in 1826 and still current), and the *Mémoires* and *Bulletin de l'Académie de medecine* are typical examples.

About the middle of the 19th century, yearbooks began to be regularly published. About the same time Virchow's *Archiv für Pathologische Anatomie* and the *Comptes rendus* of the *Société de Biologie* of Paris began publication. There are now literally hundreds of such journals published in the various countries and languages. The tendency to extreme specialization in medical journalism became marked in the last quarter of the century when special journals for narrow interests were published. *Mind* (1876), *Brain* (1879), and *La Cellule* (1884), are typical examples. Garrison notes that the contribution of the 20th century to medical journalism is the large number of recent periodicals devoted to the psychological and sociological aspects of the sexual instinct.

In Italy medical journalism developed rather slowly, Italian professors being inclined rather to write books than the shorter articles. Certain special subjects like electrotherapeutics, because of Galvani's and Volta's discoveries, were covered early. *Il Galvani*, with the subtitle *Giornale di Elettro-Idro-ed Aero-Terapia*, was published at Milan at the beginning of the 19th century. All medical therapeutics was reduced to electrical terms by it. Since then the Italians have the habit of calling their medical journals after their great physicians, and have had journals named for Cesalpino, Malpighi, Spallanzani and a number of other distinguished medical discoverers.

A very early attempt at the publication of a medical journal in America was made through a translation of the French *Journal of the Military Hospitals*, under the title of *A Journal of the Practice of Medicine, Surgery and Pharmacy in the Military Hospitals of France* (Vol. I, No. 1, New York 1790). This contained some 120 pages but is the only number that has come down to us.

The first medical journal published in America was the *Medical Repository*, a quarterly, under the editorship of Samuel L. Mitchill, Edward Miller and Elihu Smith. It was founded in 1797, and the interest which it aroused can be best appreciated from the fact that of volumes I and II, a second edition was printed in 1800 and exhausted, and a third edition issued in 1804. This is the only time in the history of American medical journalism that this has happened. The *Medical Repository* continued publication until 1824. Its success led after a few years to the almost simultaneous foundation at Philadelphia of two medical journals, *The Medical Museum* (1804–11) and the *Philadelphia Medical and Physical Journal* (1804–09). Though neither of these lasted long, the establishment of other medical journals went on apace. In Boston, the *Medical and Agricultural Register* was published for two years (1806–07), the *Baltimore Medical and Physical Recorder* for a similar period (1808–09). An effort was made to attract additional readers in these journals by including subjects of cognate interest. This was also the case with regard to the *American Medical and Philosophical Register* (New York), which lasted, however, only some five years (1810–14). *The New England Journal of Medicine and Surgery* had a happier fate, enduring some 15 years (Boston 1812–28). Philadelphia had by this time, owing to professional jealousies and politics and the mismanagement of medical schools in New York, come to be the centre of medical education in the United States and the medical journalism of the country focussed there. The *American Medical Recorder* (1813) lasted more than 10 years and was followed by the *Philadelphia Journal of the Medical and Physical Sciences*, founded in 1820 by Nathaniel Chapman. In 1825, the title of this journal became the *American Journal of the Medical Sciences*, still with us. Under the editorship of Dr. Isaac Hays and his son, this came to be the representative American medical journal long known as *Hays' Journal*. The oldest American medical weekly in existence is the *Boston Medical and Surgical Journal*, founded in 1828, whose editors have been some of the most distinguished physicians of Boston. The *Medical News*, founded in Philadelphia by the younger Dr. Hays in 1843, was transferred to New York (1896) and combined with the *New York Medical Journal* (1905). This latter was founded in 1865, followed almost immediately by the *Medical Record* (1866), both still in existence.

The first medical journal issued west of the Alleghanies was the quarterly *Reporter of Medicine, Surgery and Natural Sciences*, issued at Cincinnati, 1822. The first Canadian medical periodical was the *Journal de Médecine de Quebec*, issued in 1826.

The founder of medical journalism in its modern sense, as not only a carrier of news and information for physicians but also as a force for the uplift of the profession, the regulation of the practice of medicine, the direction of medical legislation, and the exposure of abuses, was Thomas Wakley, an Englishman who in 1823 founded *The Lancet* in London. When this appeared there were a great many abuses, especially in hospital practice and medical education needing correction. Hospital posts and even sometimes medical professorships had become family matters, subjects of inheritance. Hospital instruction was so given that it reached but a very limited number. Wakley began by publishing the hospital lectures of professors for the benefit of the profession. When Abernethy, the distinguished London surgeon of the time, applied for an injunction against the publication of his lectures without his permission, Lord Eldon decided that lectures delivered in hospitals were public property. The trial proved a good advertisement for Wakley and his work, and after a time he was elected to Parliament and he became the most important factor in England for the correction of social abuses by legislation. *The*

Lancet has always continued the work of its founder in this regard, and has been noted for its crusades against food and drug adulterations, its campaigns for the correction of medical abuses, and its leadership of the medical profession of England generally for the amelioration of medical social conditions. The work of *The Lancet* was not only supplemented but extended in England, when the *British Medical Journal,* representing the British Medical Association, was founded in 1857. The association, organized in 1832, published yearly 'Transactions' until 1853, and then the *Association Medical Journal,* which was succeeded by the *British Medical Journal* after some five years. The *British Medical Journal* has come to be a most powerful factor for the correction of medical abuses and the exposition of impositions of various kinds upon the profession as well as the public. The American Medical Association, founded in 1847, did not establish its journal until 1883. This was scarcely more than a weekly 'Transactions' until under the management of Dr. George Simmons, at the beginning of the present century, it began to be thoroughly representative of the best interests of the medical profession in America and of the genuine medical interests of the public, taking its place worthily beside the *British Medical Journal.* The *Journal A. M. A.* initiated the reform of medical education by securing four-year courses and full-time professorships in the medical schools, and thus has secured a noteworthy reduction in the number of schools of medicine in the country, decidedly to the advantage of medical teaching generally. It was enabled to do this through its reorganization of the American Medical Association which strengthened State and county medical organizations and brought a reform of their medical journals. The advertising abuses of medical journals were emphatically pointed out and an initiation of reform secured. The *Journal A. M. A.* has done extremely valuable work for the medical profession and the public in the exposure of quacks, the regulation of physicians' registration and, above all, the analysis and exposure of so-called patent medicines, many of which selling in very large quantities, at expensive prices and bought particularly by the poor, were shown to contain either such harmful materials as alcohol or cocaine as their chief ingredient, or else to be made up of absolutely inert materials like salt or sugar and water, slightly colored.

The success of the London *Lancet* led to the foundation of the *Lancette Française* in 1828, which followed the plan of reporting hospital lectures and afterward became the *Gazette des Hopitaux,* which still continues. The *Gazette Médicale de Paris* was founded in 1830. Other French journals in large numbers were founded in the second half of the 19th century and the weekly newspapers were supplemented by the *Progrès Médicale,* paying attention particularly to current medical items, Paris, 1873. In the last quarter of the 19th century a whole series of such weekly journals meant to carry medical news and represent the medical profession as well as organize the correction of abuses, were founded in various parts of the world. The *Deutsche Medizin, Wochenschrift* in 1875, *Vrach* in Saint Petersburg in 1880, and Geneva, Munich, Prague, Rome, Vienna and many other cities came to be represented in this way.

At the beginning of the European War, there were some 1,700 medical journals published in the various languages. Their distribution was as follows: the United States had 630; Germany, that is, the German-speaking countries, 451; the French, 268; the British, 152; the Italian, 75; the Spanish, 29. This was entirely too many for the maintenance of such proper standards as would make them seriously valuable and prevent abuses. Many of them were published almost entirely as a means of propagating information for business purposes with regard to various drugs and preparations, the journals being established for this purpose, or the proprietors allowing their columns to be used for such exploitation because of the money paid for advertising. The more medical journals the lower the standards. The war, with its scarcity of paper, has brought an end to a great many of the proprietory medical journals and undoubtedly will in its course do much to purify the field of medical journalism.

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JAMES J. WALSH, M.D.

MEDICAL JURISPRUDENCE, the science of applying medical knowledge to the purposes of legal investigation; the application of the principles and practice of various branches of medicine in judicial proceedings requiring the explanation of doubtful questions, such as those relating to conception and birth, time and cause of death, physical and mental diseases, etc. Medical jurisprudence is often spoken of as forensic medicine, that is, the medicine of the forum. It embraces subjects both purely medical and purely legal, and covers a very wide range. These questions have usually been considered under five divisions: (1) Such as arise out of the relation of sex, including impotency, pregnancy, legitimacy and rape; (2) injuries to persons, as wounds, death from violence, poisoning and abortion; (3) disqualification by different forms of mental diseases; (4) feigned disability or disease; (5) questions as to age, identity and life insurance. The major part of what is known as medical jurisprudence relates to evidence given in courts, even if the whole subject is not properly embraced within the subject of judicial evidence. As medical books can be used only in a very restricted sense in judicial proceedings, the testimony of medical experts has become very important. Our laws do not give recognized preference to any particular class or school of medical practitioners as qualified for expert witnesses. Knowledge is the test of qualification to give such evidence. The presiding judge passes, as a preliminary, upon the question of qualification and determines whether the witness shall be permitted to testify. The opinion of a medical expert is never conclusive but is simply to be regarded by the judge or jury in the same manner as other evidence given to assist in establishing a fact. The medical expert is fre-

quently called upon to state facts, as well as to give his opinion based upon facts shown by other testimony to exist. He may testify as to the health of a patient whom he had treated, of his habits and mental traits. He may testify that he found poison in the stomach of a person found dead and give an opinion as to whether the poison caused death. He may give an opinion as to how long a person has been dead, from the condition of the body when found; whether a certain wound would produce death; and his opinion as to the instrument used to inflict the wound.

In all of these subjects of investigation the evidence of a medical expert is almost indispensable. In matters of life insurance, where the insured dies shortly after a policy has been issued to him, medical expert examination and evidence are often of great importance, bearing upon the condition of the insured at the time of insurance and upon the question of representations. In suits for injuries to persons through the fault of others the question of the extent and probable continuance of disability are to be investigated with the aid of expert evidence. Many questions of supposed crime could not be properly determined without the knowledge and skill of the physician, applied as science directs. In cases involving sanity and mental capacity medical jurisprudence reaches the zenith of its importance. The untrained non-scientific mind cannot measure the status and capacity of other minds. If it is difficult, sometimes nearly impossible, for the best informed to determine accurately the physical condition of a person, none but those eminent for knowledge of and experience in matters of the mind ought to judge of its condition and hazard opinions as to its peculiarities and capacity. Insanity is a disease of the mind which assumes many forms — almost as many as there are different phases in the human mind. Many definitions are given of insanity, one of which is that it is a physical disease located in the brain, which deranges the mental and moral faculties to a greater or less degree. This definition is not quoted in preference to any other for the purpose of approval, but because it differs so radically from others, and to show the difficulty of comprehending the nature of this dread malady. The general term insanity comprehends all shades of mental diseases, from the slightest abnormal condition to that of the wildest maniac. The expert alienist is called upon to testify as to a person's ability to make a will, a contract or to transact any kind of business. He is asked to decide whether a person is bereft of his normal reason to the extent that prudence requires his confinement; and when he has been confined, whether it would be safe or prudent to let him have his liberty. The questions upon which the expert's opinion with regard to the insane, or those supposed to be insane, are asked can hardly be enumerated. The importance of the subject cannot be overestimated, and new and earnest efforts are being constantly exerted by the medical profession to render its information upon this difficult subject as full and complete as possible. Many works upon medical jurisprudence have been published and in all of them insanity, in its various forms, has had a prominent place, while quite a number of authors have produced commendable works devoted entirely to the subject of the medical jurisprudence of insanity. Consult Brothers, 'A Statement of the Law of Forensic Medicine' (Saint Louis 1914); Reese, J. J., 'Textbook of Medical Jurisprudence and Toxicology' (8th ed., Philadelphia 1911); Robertson, 'Manual of Medical Jurisprudence, Toxicology and Public Health' (2d ed., London 1913), and 'Medical Serials, with Bibliography of Medical Jurisprudence' (2d ed., New York State Library, Albany 1910).

MEDICAL ORGANIZATION IN THE UNITED STATES ARMY. The Medical Department of the Army, of which the surgeon-general is chief, aims: 1. To conserve the strength of men and officers — (a) Through prompt attention to disease and disabilities revealed by physical examination; (b) through supervision of sanitary conditions.

2. To move non-effectives to the rear without using effective fighting men for such service and without in any way obstructing military operations.

3. To provide medical and surgical care for the sick and wounded (including control and management of military hospitals), restoring the disabled to active military service or to useful and remunerative places in civil life.

The service of the medical man is constant. Every recruit must be examined, because the army must be without weaklings and without disease. Health must be maintained. Prophylactic measures must be instituted and insisted upon and remedial measures applied both for illnesses in camp and as a result of battle casualties. It is the doctor's job to make and keep the soldier fit to fight. His work is to a tremendous degree effective in preserving the morale of the army. It is the task of the medical department to succor the wounded so swiftly that their comrades may know that, should their turn come, they will be cared for as expeditiously and efficiently as is possible. Thus the medical men directly heighten the morale of troops.

The army doctor used to be one who could do a little of everything in an emergency — he was pretty much in the same class with the country doctor of 30 years ago. Major-General Gorgas once said: "I do not think we have a more useful man in the army than the medical man who can pull a tooth, bind a finger, or take charge of the casualties that occur in a moving command, and do all these things equally well."

The medical department consists of the medical corps, medical reserve corps, contract surgeons, dental corps, dental reserve corps, veterinary corps, veterinary reserve corps, nurse corps, sanitary corps, ambulance corps and enlisted (formerly hospital corps) men.

The insignia of the medical department is a caduceus of bronze metal one inch high; the letters D., S. A., and C.S. in gilt metal superimposed, designating, respectively, Dental, Sanitary and Ambulance Corps and Contract Surgeons. Also, all persons belonging to the sanitary service, and chaplains, wear on the left arm a brassard bearing a red cross on white ground — the emblem of the sanitary service

of armies — and all sanitary formations display the Red Cross flag with the National flag. All sanitary service material is marked with the Red Cross emblem. Green lanterns distinguish sanitary units at night.

Expansion of the Medical Organization during the Great War.— In the Army Appropriation Bill of 29 June 1918 (H. R. 12281), provision for an increase in the number of officers in the higher commissioned grades of the medical department was made as follows:

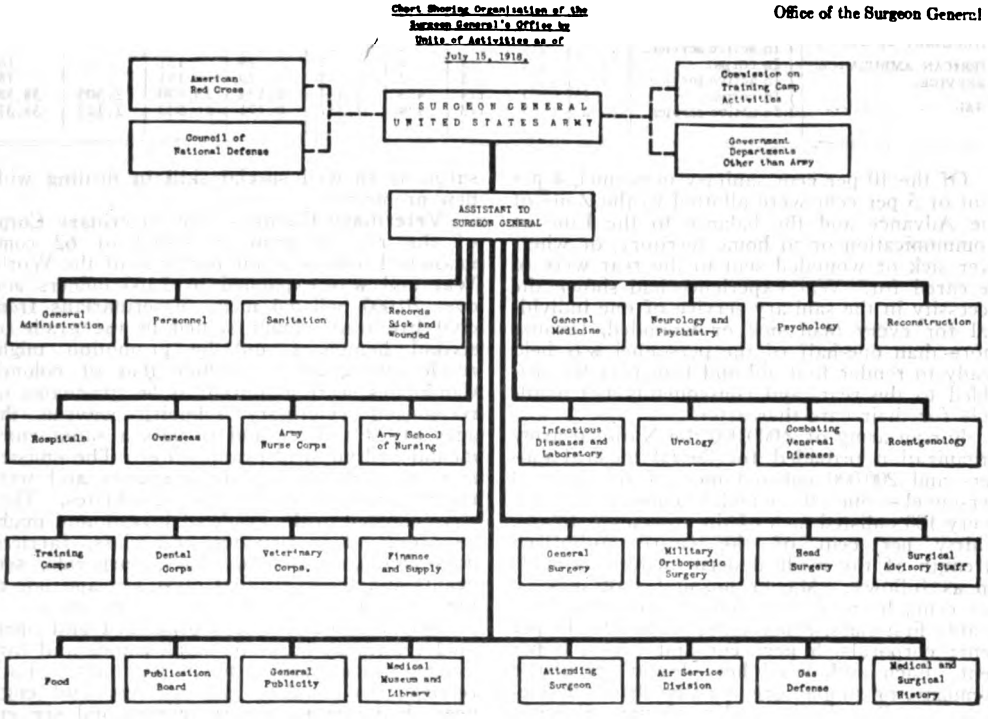
"*Increase in medical department.*— That the medical department of the regular army be, and is hereby, increased by one assistant surgeon-general, for service abroad during the present war, who shall have the rank of major-general, and two assistant surgeons-general, who shall have the rank of brigadier-general, all of whom shall be appointed from the Medical Corps of the regular army.

"That the President may nominate and appoint in the medical department of the National army, by and with the advice and consent of the Senate, from the Medical Reserve Corps of the regular army not to exceed two major-generals and four brigadier-generals.

"That the commissioned officers of the Medical Corps of the regular army, none of whom shall have rank above that of colonel, shall be proportionately distributed in the several grades as now provided by law.

"That the commissioned officers of the Medical Reserve Corps of the regular army, none of whom shall have rank above that of colonel, shall be proportionately distributed in the several grades as now provided by law for the Medical Corps of the regular army: Provided, That nothing in this act shall be held or construed so as to discharge any officer of the regular army or deprive him of a commission which he now holds therein."

The proportion of commissioned medical officers in the regular army is not to exceed seven for every thousand of the total enlisted strength of the regular army. They must be citizens of the United States. The relative rank percentages of the commissioned officers below brigadier-general is as follows: colonel, 3.16; lieutenant-colonel, 5.42; major, 23.70; captain and lieutenant, 67.72.



At the entrance of the United States into the World War (April 1917) the Medical Corps comprised 452 officers, and there were 2,600 members of the Medical Reserve Corps enrolled but inactive. Officers commissioned in the medical department for the week ended 4 Oct. 1918 totaled 35,374, the distribution being as shown in table on following page.

An applicant for appointment in the Medical Reserve Corps was required to be between 22 and 55 years of age, and to be qualified to practise medicine in the State or Territory in which he resided. In general, the personnel of the Medical Reserve Corps were successful physicians and surgeons in private practice. To join, one had to apply to the adjutant-general of the army for examination; then followed successively, preliminary examination, physical and mental. After qualifying as to physical stamina, clinical skill and aptitude for the mili-

tary service, the applicant was recommended for a commission by the surgeon-general, and appointment by the President followed.

The provision that a major might not be appointed after 45 was changed when the need for medical officers for the Great War became acute.

		Maj. Gen.	Brig. Gen.	Col.	Lt. Col.	Major	Capt.	First Lieut.	Second Lieut.	Total
MEDICAL CORPS	In corps	2	7	160	427	2,229	8,266	16,743	.....	27,834
	In active service	2	7	159	403	2,132	7,913	16,196	.....	26,812
DENTAL CORPS	In corps	....	....	12	19	84	284	5,546	.....	5,945
	In active service	....	....	12	19	84	284	3,736	.....	4,135
SANITARY CORPS	In corps	....	....	1	2	61	426	945	874	2,309
	In active service	....	....	1	2	61	426	945	874	2,309
VETERINARY CORPS	In corps	....	....	....	3	59	119	505	1,631	2,317
	In active service	....	....	....	3	59	119	505	1,248	1,934
AMERICAN AMBULANCE SERVICE	In corps	....	....	1	2	1	29	151	.....	184
	In active service	....	....	1	2	1	29	151	.....	184
TOTAL	In corps	2	7	174	453	2,434	9,124	23,890	2,505	38,589
	In active service	2	7	173	429	2,337	8,771	21,533	2,122	35,374

Of the 10 per cent sanitary personnel, 4 per cent or 5 per cent were allotted to the Zone of the Advance and the balance to the Line of Communication or to home territory, or wherever sick or wounded sent to the rear were to be cared for. War experience had shown the necessity in the sanitary service of one individual for every man sick or wounded, because more than one-half of the personnel was held ready to render first aid and transport the disabled to the rear, and consequently not available for their care thereafter.

For an army of 2,000,000 the National army organization provided for 20,000 medical officers and 200,000 enlisted men of the medical personnel — one officer and 10 enlisted men for every 100 enlisted men of the combatant forces. Thirty per cent of the entire authorized strength of the medical department was made up as follows: Master hospital sergeants, ½ per cent; hospital sergeants, ½ per cent; sergeants first-class, 7 per cent; sergeants, 11 per cent; corporals, 5 per cent and cooks, 6 per cent. Each authorized horsedrawn ambulance company, or similar organization, had a horseshoer, saddler, farrier and mechanic. Privates first-class were eligible for ratings for additional monthly pay as follows: As dispensary assistant, $2; as nurse, $3; as surgical assistant, $5.

Dental Corps.— The Dental Corps comprised commissioned officers of the same grades and proportionately distributed among such grades as were provided for the Medical Corps. There was one dental officer for every thousand of the total strength of the army. The dentists of the country were particularly alert during the war with Germany, and the profession was mobilized to such a degree that there were sufficient dentists available for an army of 5,000,000 men. In the examination of recruits dental defects were remedied by the gratuitous performance of hundreds of thousands of operations. The Dental Corps division of the surgeons-general's staff enrolled dental officers, recommended them for assignment and promotion, appointed examining and review boards and developed plans for service in the United States and abroad. The examining and review boards consisted of an officer from the Medical Corps and two officers from the Dental Corps. Mobile operating dental units in the shape of motors equipped as dental offices on wheels were in use at camps in the United States and with the army in France. Dental officers were assigned to base and general hospitals, and the dental surgeons showed special skill in dealing with new problems.

Veterinary Corps.— The Veterinary Corps of the regular army consisted of 62 commissioned officers at the outbreak of the World War and was expanded to 2,100 officers and over 20,000 enlisted men. Veterinarians from civil life were commissioned in the grade of second lieutenant and by promotion might reach any grade to include that of colonel. Candidates were required to be graduates of recognized veterinary schools, between the ages of 22 and 55, and to pass a satisfactory mental and physical examination. The enlisted men assisted the veterinary officers and were not required to be veterinary graduates. They were enlisted in the grade of private and might be promoted to privates first class, farriers, horseshoers, wagoners, cooks, corporals, sergeants and sergeants first class, for aptitude in the duties required in these various grades.

The Veterinary Corps organized and operated veterinary hospitals at all camps and cantonments possessing public animals. Each regiment of cavalry, field artillery and engineers had two veterinary officers and six enlisted men attached to it for the care of sick and the preservation of the health of well animals. Each division had a division veterinarian who supervised the veterinary service of the division. All animals purchased by the government had first to be passed on, as to soundness, by an army veterinarian. Shipments of animals by rail and all boats for transporting them overseas were accompanied by veterinary officers and enlisted men. Veterinary laboratories were maintained to aid in the detection and elimination of communicable animal diseases. The Veterinary Corps was also responsible for recommendations pertaining to veterinary sanitation wherever there were public animals. The meat inspection service of the Veterinary Corps covered the inspection of all meats and meat food products used by the entire army at the time of purchase and when issued to troops. All meats bought for shipment overseas were inspected by veterinary officers to make sure they were fit for human consumption and that they complied with govern-

ment specifications. Animals slaughtered in the field for food purposes were also subject to inspection as were dairies and milk herds supplying milk to the army.

Veterinary hospital units were organized and operated by the Veterinary Corps for use in the theatre of operations. Some of these were established as hospitals on the line of communication and at the base, and others operated from the front to collect sick and injured animals and evacuate them to these hospitals in the rear. Animals able to walk were led to the point where they could be loaded into railroad cars, while the more seriously injured ones were conveyed in motor ambulances. The hospitals were equipped with operating tables and complete outfits of instruments so that any necessary surgical measure might be carried out. Special hospitals for communicable diseases were also established where infected animals were isolated for the protection of others. By these means it was possible to restore to usefulness many thousands of animals which would otherwise have been lost.

Army Nurse Corps.— The Army Nurse Corps recruits nurses for the service, enrolls them and controls their movements. There is one superintendent appointed by the Secretary of War, and chief nurses and reserve nurses are appointed and removed by the surgeon-general with the approval of the Secretary of War. The Army Nurse Corps consists of trained nurses. The Red Cross as the reserve of the Army and Navy Nurse Corps has supplied many nurses for the Army Nurse Corps. When once assigned to the Army Nurse Corps the nurse is subject to the rules of the army as administered by the surgeon-general's office.

At the entrance of the United States into the war with Germany there were about 400 nurses and 7,000 enlisted men in the medical department. Less than a year later there were 7,000 nurses, and in September 1918 there were more than 16,000 on the rolls of the Army Nurse Corps, of which number (from April 1917 to 1 Aug. 1918) the Red Cross had placed 13,111 nurses, the rate of assignment of nurses to the military authorities by the Red Cross having been 55 per day from the beginning of 1918. The total Red Cross enrollment of graduate nurses eligible for the Army Nurse Corps (as of 2 July 1918) was 22,736, including those serving in the Army Nurse Corps. It was estimated that 50,000 nurses would be required for an army of 2,000,000 (one nurse for 10 beds if 25 per cent were hospitalized, the maximum provided for, based on British experience, or with a minimum hospitalization of 17 per cent, 51,000 nurses for an army of 3,000,000). Emphasizing the need for nurses, the acting surgeon-general of the army stated on 17 Sept. 1918 that not only must 25,000 nurses be obtained before 1 Jan. 1919 (9,000 in addition to the 16,000 then in service), but (if the war continued) that by 1 July 1919, 50,000 would be required — thus indicating that in less than a year 34,000 would have to come forward to meet the need. To increase the number of nurses there was established on 25 May 1918, under the surgeon-general, an Army School of Nursing, which gave immediate opportunity for service, providing an adequate course of training for young women between the ages of 21 and 35, who had a high school education or its equivalent; it at the same time made possible the release of a large number of graduate nurses eligible for service in the Army Nurse Corps. Under date of 13 Sept. 1918, the surgeon-general announced that the 50 American hospitals which organized base hospital units for service in France had been notified that they might invite a limited number of their student nurses to go to France, where they would have the privilege of rendering service and, at the same time, complete their training under representatives of their own schools in base hospitals abroad. These were mostly seniors, and those who went across included the young women who were first to be enrolled in the Army School of Nursing. Each unit of 25 was in charge of a graduate nurse. Student nurses not so far advanced were placed in base hospitals in the United States. Women called "hospital assistants"— a position created by the surgeon-general for women offering to nurse wounded soldiers — were enrolled through the Red Cross and assigned to convalescent hospitals in the United States, where training units were not established. These hospital assistants were married women between 21 and 40, whose husbands were overseas, and single women between the ages of 35 and 45. They were high school graduates or had present educational equivalents.

At the request of the surgeon-general certain well-known medical colleges allied with hospitals gave special three months' courses for nurses' aids. These young women were to serve as anesthetists, laboratory assistants, nurses' helpers and, in emergency, ward nurses. There were, on 1 July 1918, 48,000 in training schools for nurses, and a campaign to recruit 25,000 student nurses was launched (July 1918), conducted under the auspices of the committee on nursing and women's committee of the Council of National Defense, with the cooperation of the surgeon-general's office and the American Red Cross.

Ambulance Corps.— The Ambulance Corps, which had in August 1918, 9,000 or 10,000 men with 80 sections serving behind the French, English and Belgian lines and 30 sections behind the Italian trenches, with additional units in training at Allentown, Pa., was started at Allentown in May 1917, to meet the emergency needs of the French in response to an appeal by Marshal Joffre. One hundred sections were trained in driving ambulances, carrying litters and in first-aid treatment. Forty colleges sent men, and there were soon 4,500 on hand. The service abroad absorbed the privately raised and financed automobile ambulance units manned by American volunteers. An ambulance section consisted of a captain or lieutenant commanding and 45 enlisted men. An officer of the Motor Transport Corps checked up on operation and maintenance. Hospital units of various kinds came to Allentown for training prior to departure abroad. The camp became strictly medical, with men in training for all branches in this service, the men for the laboratory units, field hospital units and organization to conduct base hospitals being obtained principally from the medical training camps at Fort Oglethorpe and Fort Riley.

Hospital Corps.— The men of the Hospital Corps available for service with line

organizations and with the sanitary train are designated in time of peace, and at the time of mobilization for war they are ready to join their respective commands. Each has the proper personal equipment and has been instructed as to first-aid treatment. Field equipment is maintained at designated stations ready for use.

Sanitary Officers.— Medical officers in command of sanitary units attached to units of the line smaller than a division (the sanitary units being temporarily separated from direct headquarters control) report these units to the senior line officer in command.

The department surgeon is chiefly an advisory officer, but in matters relating to activities of the sanitary service within his department he acts in an administrative capacity, supervising the work of the department and examining and passing on reports. His watchfulness over sanitary conditions is constant and he immediately reports orally to the commanding officer as to remediable defects, with recommendations. In mobilization camps physical examinations are made and recorded by the department surgeon and sanitary inspector and their assistants, who also vaccinate against smallpox and typhoid fever, and report the sick list to the company commander, making appropriate records. Each mobilization camp for State National Guard troops was in charge of an officer of the regular army. He had on his staff a camp surgeon, usually a medical officer of the regular army. Surgeons at ports of embarkation and at rest stations were the sanitary advisers of the commanding line officers in all matters pertaining to the Medical Department. The Medical Department sees to it that all individuals and organizations in the army are furnished such equipment as pertains to the Medical Department, and such training in sanitary matters is given to both line troops and sanitary troops as is possible and as is appropriate to each.

The regulations defining duties of medical officers contain the following: "While officers acting as technical advisers of their commanders are responsible for pointing out insanitary conditions and making proper recommendations for their correction, the direct responsibility rests with the commander. If, however, the commander authorizes the medical adviser to give orders in his name for the correction of defects, then the duties and responsibilities of the latter are correspondingly increased."

Contract Surgeons.— Contract surgeons are not given commissions, but they wear the uniform when on active duty. They are expected to give their entire time to the public service. Short-term contracts are made with graduates of reputable medical schools and long-term contracts with graduates and qualified practitioners after examination. There are two forms of contract: standard, $1,800 a year, and substandard, $75 a month with subsistence, mileage, etc. Of the 151 contract surgeons in the service (in September 1918) 34 were women.

Civilian Personnel.— In administrative offices, supply depots and hospitals, there are civilian employees including clerks, messengers, watchmen, contract nurses, cooks, packers and laborers, those other than unskilled laborers being subject to civil service rules. Service volunteered in emergency by individual civilian physicians, nurses, litter bearers, cooks et al., is often accepted by the surgeon of any organization operating independently, or by the commanding officer of a general hospital, with the consent of his commanding officer and under the authority of the surgeon-general.

The personnel of the Medical Department, and all other persons assigned to duty with that department, are collectively called sanitary troops. In time of war the Sanitary Service includes (a) all persons serving in or employed by the Medical Department, including officers and men temporarily or permanently detailed therein; (b) individuals whose voluntary service with the Medical Department is duly authorized, and (c) members of the Red Cross assigned to duty in the Medical Department. The American Red Cross, of which the President of the United States is head, aids under an act of Congress, approved 24 April 1912. This organization is, as per its charter (Act of 5 April 1905), "a medium of communication between the people of the United States and their Army." The Red Cross has its own organization, acting under the direction of the ranking medical officer of the unit.

Co-operating Agencies.— Other auxiliary and co-operative aids of the Medical Department, with which the office of the surgeon-general is in communication but does not control, include the War Department and Navy Department Commissions on Training Camp Activities (having supervision of regulations dealing with the suppression of the sale of alcoholic liquors within the five-mile zones around camps and cantonments and of prostitution within 10 miles), United States Public Health Service of the Treasury Department (which has recently taken over the work for civilian co-operation in combating venereal diseases), the Chemical Warfare Service of the War Department (which now has charge of gas defense activities), and the General Medical Board of the Council of National Defense.

General Medical Board.— The last-named body worked in close co-operation, and aided in the expansion of the nation's medical program during the war through co-ordinating the civilian resources with those of the government. It stimulated enrollment of physicians in the Medical Reserve Corps, and organized the Volunteer Medical Service Corps, aimed to enlist the services of all physicians, both men and women, during the emergency, who were not already in the government service. In November 1917 the provost marshal-general requested the Council of National Defense to nominate a man in each State as medical aide to advise the governor as to medical questions which would arise in connection with the operation of the Selective Service Law. The chairman of the General Medical Board appointed a committee on medical advisory boards, which met and selected a representative from each State. These were called to Washington and received their instructions. The committee on medical advisory boards formulated a plan, outlining the duties of these aides, in the selection of the personnel of medical advisory and local boards and organization of medical activities under the Selective Service Act. Rules of procedure were prepared and approved by the provost

marshal-general. It was announced, 28 Sept. 1918, that medical aides in States having a population of more than 500,000 had been commissioned in the army with the rank of major, and in other States with the grade of captain.

The General Medical Board has committees on child welfare, civilian co-operation for combating venereal diseases, dentistry, editorial, hospitals, hygiene and sanitation, industrial medicine and surgery, legislation, medical advisory boards, medical schools, nursing, publicity, research, States' activities, surgery, volunteer medical service corps and women physicians.

Surgeon-General's Office.— The office of surgeon-general, as the heart of the Medical Department of the army, during the war had a great administrative group, with the immediate office management in charge of chief clerk and civilian employees, the several divisions being in charge of army officers of special experience and qualifications.

The enormous expansion in the work of the surgeon-general's office is indicated by a few comparisons. Just prior to the declaration by the United States (6 April 1917) that a state of war existed between the United States and Germany, the surgeon-general's office staff comprised six officers, including Surgeon-General Gorgas, and 20 clerks, and occupied three rooms in the State, War and Navy Building. By 1 Dec. 1917, 165 officers were detailed here, there were 535 clerks, 300 office rooms were required, five whole buildings and parts of 20 others were being occupied, and more space was needed. There were 14 divisions and 13 special sections comprising 27 units of activity. Within a year after the war began the whole administrative force comprised 359 officers and 1,008 clerical employees, including enlisted men, and 150,000 mail items and 9,500 telegrams were being handled monthly. These figures do not include the gas defense service, which later became the Chemical Warfare Service of the War Department, and attached to which there were 2,364 commissioned officers and 20,344 enlisted men. In the year ended 31 March 1918, the department personnel increased from 8,000 to 106,000; 900 officers to 18,000; 375 nurses to 7,000, and an ambulance service of 6,000 men was entirely created. The seven hospitals in the United States were increased to 63, with more to come; their bed capacity of 5,000 was increased to 58,400, and provision of bed capacity in France was made for 20 to 25 per cent of the strength of the American Expeditionary Forces. Whereas the appropriation for the Medical Department in peace times was about $1,000,000 a year, appropriations for the fiscal year ended 30 June 1918, totaled $130,000,000, of which there had been expended up to 1 April 1918, $95,000,000, and the current annual outlay was at the rate of $160,000,000.

The Finance and Supply Division, in charge of medical supply and disbursing officers, purchases, stores and transports all supplies and material for the Medical Department and disburses and accounts for its moneys. Medical supplies are issued in definite units and amounts, the supplies to the various units of the medical service and the sizes of original packages being fixed by definite supply tables.

In addition to vehicular units for the transportation of supplies, other units of transportation in the Medical Department during the war included mobile hospitals, wards and operating rooms, motor dental units which were offices on wheels, x-ray motor outfits — the modern substitute for the probing methods of old-time military surgery — lorries bearing steam delousing apparatus or disinfectors and laundries. Each regiment had three medical carts. Pack mules carry fixed quantities of supplies. An officer of the newly-created Motor Transport Corps was stationed with each command to check up on operation and maintenance.

As the functions of the department were and are preventive and curative, the Division of Field Sanitation was of great importance, for it recommended sites for camps, looked after mosquito prevention, drainage, water supply, ventilation, the disposal of waste and the elimination of flies. Spots near camps where mosquitoes and flies breed were cleaned up. Each camp had a division or camp surgeon, and, as assistant, a sanitary inspector who had the assistance of a sanitary engineer and from 100 to 200 enlisted men employed in work designed to protect the health of soldiers. The sanitary engineering section of the surgeon-general's office and sanitary engineers of the construction division of the army co-operated in inspections as to the need of increased sanitary facilities and sewage disposal plants. Ditching and oiling still bodies of water and daily spraying with oil of breeding spots were among the duties performed. Much of this work was done in co-operation with the United States Public Health Service within a radius of a mile outside the camps. Buildings where food was prepared or stored were screened, and a report in the late summer of 1918 stated that 22,700,000 square feet of screen had been placed in all the camps and 6,000 fly-traps placed in each camp. This work was largely responsible for the prevention and control of epidemic diseases.

Hygienic standards, collective and individual, of troops in camp and in transport on land and sea, were being constantly improved. Hygiene is taught West Point cadets and all commissioned officers, so that they were enabled to teach the enlisted men; moreover, the latter were given instruction by their company officers in first-aid hospital training and field hospital work, this instruction being supplemented by drills of sanitary units in the presence of the enlisted men. Pamphlets and moving pictures were further aids in instructing in hygiene and in the reduction of venereal diseases. In addition to thorough physical examination, all officers and enlisted men of the army under 45 years of age were required to be immunized against typhoid fever. All recruits and all the personnel of a military command were vaccinated against smallpox when the surgeon responsible deemed it necessary. Special units were provided for men with remediable physical defects, specialists aiding the surgeons in charge. Tests also were made to detect malingering.

The precautions and supervision in the camps for the young men taken from civil life into the army resulted in the showing for the week ended 9 March 1918 of an annual death rate from disease of 6.6 per 1,000, a figure below that of men in civil life ranging from 20

to 39 years of age, the census bureau giving the rate for this class as 6.7. Steady reduction of the disease rate continued in the succeeding months and for the week ended 26 July it was reported that the annual death rate from disease, based on combined reports of the American Expeditionary Forces and of troops stationed in the United States, was 1.9 per 1,000 — less than two men per 1,000 per year. The average annual death rate from disease during the two months ending 26 July was 2.8 per 1,000. For the sake of comparison, in the Crimean War the English and French lost 350 of every 1,000 men through disease; in the Mexican War in the 40's the annual death rate from disease of United States troops was 100 per 1,000; in the Civil War, 40 per 1,000 in 1862 and 60 per 1,000 in 1863; in the Spanish War, 25 per 1,000; and in the Russo-Japanese War, 20 per 1,000, this being the lowest previous annual death rate from disease. From statistics of the executive division of the general staff of the army, it appears that, in the Mexican War, seven men died from disease to one killed in battle; in the Civil War the disease mortality, though greatly reduced, was still nearly double the battle mortality; and in the Spanish War there were more than five deaths from disease to one in battle; and in the first 10 months of American participation in the World War the records of the American Expeditionary Forces show an exact parity between battle mortality and disease mortality, but this is little more than half of the battle mortality and less than a third the disease mortality of the Civil War.

Particular attention was paid to empyema and to pneumonia epidemics. A special commission of physicians and pathologists studied the problem, aided by special teams of physicians and pathologists in each camp. The division of surgery perfected arrangements, in accordance with the system recommended by the commission, for quarantine and isolation and prophylaxis. The methods employed were necessary on account of the gatherings of large bodies of recruits. If, despite precautions, empyema did result, the surgeons adopted the policy of treating by operation for drainage of the chest.

The division of food and nutrition placed nutrition officers in every camp and cantonment where at least 10,000 were in training, in the United States and abroad. Nutritional surveys were conducted for the purpose of investigating food in storage, in transit and in preparation; cooking and wastage were studied in all the camps, methods improved, economies instituted, and dietetics taught. Studies as to the exact amount of food consumed and percentage of waste in more than 100 messes in 40 camps were made and instructions given to mess officers. The bill of fare was carefully balanced for wheat, starch, fat, protein, minerals and vitamine, and for sugar. The soldiers under General Pershing received 3,500 to 4,200 calories of heat units daily as compared with the 2,500 calories deemed sufficient for the ordinary citizen. All nutrition officers were food specialists, mainly men and women who had been connected with colleges and public bodies as physiologists, chemists and food inspectors. As a concrete result of a two-day survey of seven companies (1,135 men), the average edible waste was found to be 1.12 pounds per man per day. Appropriate instructions as to food and mess economy were given to mess sergeants and cooks, and a second survey of the same companies showed waste of .43 pounds per man per day — a saving of .69 pounds, which was equal to $61.75 per day for the seven messes, $22,542 per year. If this ratio prevailed throughout the camp of 15,000 men, the total saving would be about $300,000 per year.

A statistical bureau attended to the collection and co-ordination of memoranda and records of sick and wounded, from the time of injury until discharge from the hospital. These records were kept in the most approved way in the surgeon-general's office with the aid of punching, tabulating and sorting machines.

Deaths of officers and men of the military personnel were immediately reported in writing by the senior medical officer present to the commanding officer. Deaths of medical officers were reported by the attending surgeon or the nearest medical officer to the department surgeon, a duplicate being sent to the surgeon-general.

Medical and dental students in civil life, whose age placed them within the jurisdiction of the selective service law, were permitted to enlist in the Enlisted Reserve Corps and placed on inactive duty so that they might continue their college courses while subject to call to active service. The Army Medical School in Washington gave instruction to junior medical officers who had passed their examinations for entrance into the regular army. The faculty, comprising commandant, professor and assistant professors, were detailed by the War Department from among the officers of the Medical Corps. Special professors were nominated by the faculty with the approval of the surgeon-general from among distinguished members of the Medical Reserve Corps. As instructors, there were officers of other branches of the army detailed by the War Department to give special courses. Officers of the Medical Reserve Corps who were candidates for appointment in the Medical Corps attended as students; also, such officers of the army and organized militia as might have been ordered or authorized to attend; also enlisted men of the Hospital Corps. The equipment included library, laboratories and all the other usual appointments of a medical college. Important in the system of training was the training school at Camp Greenleaf, Fort Oglethorpe, Georgia, where 2,500 physicians from civil life entering the Medical Reserve Corps as officers and 6,000 enlisted men of the medical department (Hospital Corpsmen) were constanly undergoing an intensive three months' course in training for all phases and branches of military medicine and sanitation, including physical instruction and administrative duties. The physicians could here study branches for which they might never have opportunity in their civilian practice. Special opportunity for instruction in surgery was afforded by three schools in New York City, and one each in Philadelphia, Rochester, Minn., New Orleans, Chicago, Saint Louis and Cleveland. A medical and surgical school in Paris for surgeons of the American Expeditionary Forces afforded an intensive course of one month in administration, surgery and sanitation,

with lectures by experienced surgeons; and young American surgeons had an opportunity of observing methods at French and British casualty clearing stations before being placed in base hospitals for their initial war work. The next step of the young surgeon was as head of an operating surgical "team" manning an evacuation hospital.

The Division of Internal Medicine, Tuberculosis and Cardio-Vascular Diseases selected expert examiners to eliminate the physically unfit and to guide defective men to treatment calculated to restore them to future efficiency in military and civil life. Hundreds of thousands of examinations for tuberculosis and diseases of the heart were made. This division provided hospitals for incipient cases of tuberculosis as well as for advanced cases. It also provided for examinations of gastro-intestinal diseases.

The Division of Infectious Diseases cooperated with the Division of Sanitation by selecting bacteriologists, pathologists and other laboratory men, establishing and fitting out laboratories for army posts and mobile units for general, special and research work, a laboratory being attached to every army post, mobilized division and army corps. Tests of blood specimens and analyses of stomach contents and water analyses were made in these laboratories. The medical officer is held responsible for the application of approved methods for preventing the spread of infectious diseases, the three infections most dangerous to armies being venereal, the pneumonias and cerebrospinal meningitis. Typhoid and paratyphoid are controlled at the start by vaccines, the efficacy of which was first developed by Sir Almroth Wright. Quarantine guards against measles, diphtheria and influenza; diarrhœa and dysentery are kept to the minimum by pure water, pure food and reduction of the fly nuisance. Modern medical science keeps away the old plagues of army camps — cholera by isolation, disinfection and vaccine; and spotted typhus by delousing and hot shower baths. Such cases of gout, rheumatism and Bright's disease as occur were brought into the army when the patient enlisted.

In the early stages of the World War, tetanus was common in the European armies, but it has now been practically eliminated. Research into causes of trench fever and tests in which the famous 66 volunteers from among the Americal soldiers played an important part, have led to the discovery that its transmission was due to the bites of body lice. An appropriation of $100,000 and co-operation and research with French and British surgeons are to be credited for this achievement. Trench fever had been incapacitating 8 to 10 per cent of the British troops during 1916–17 for periods of from two to three months. The importance of eliminating body-lice or "cooties" led to provision for delousing apparatus, with twin disinfecting chambers mounted on a five-ton lorry so that operation could be carried on near the trenches. Steam at five pounds pressure was passed through the air-tight chamber containing clothing to be treated, killing all living matter. Eggs remaining in seams after the disinfecting operation were removed by stiff wire brushes.

The Division of Urology (genito-urinary diseases) looked after the prevention of venereal diseases by employing prophylactic, sociological and educational measures — through the enforcement of public health and vice laws, recreation for the soldier, educational measures such as lectures, moving pictures, exhibits and literature, and also through thorough prophylactic treatment and segregation. It published a manual on venereal disease, in co-operation with the Council of National Defense Committee for Civilian Co-operation in Combating Venereal Diseases, and with the War Department and Navy Department Commissions on Training Camp Activities. There was strict enforcement of the provisions against alcohol in the five-mile zones surrounding camps and cantonments and against prostitution within ten-mile zones. This work in the civilian territory adjacent to the camps and cantonments was placed under the United States Public Health Service of the Treasury Department in the summer of 1918.

The Division of Psychology sought to eliminate the mentally unfit and to make possible the placing of men according to ability. All company officers and enlisted men were examined and the mentally superior encouraged by assignment to duties for which they were evidently fitted. Of the 150,000 examined by this division, more than 1 per cent were rejected as mentally unfit for military service. The Division of Neurology and Psychiatry was organized because it was the experience in the Allied armies that a large number of neurotic, mental and other defectives were found, who soon became useless for field service. While physically sound, they were incapable of becoming soldiers because of insanity, mental defect, epilepsy, drug habit or other nervous disorders. This division took special charge of victims of the varieties of "shell shock," who are cared for in a base hospital specially set aside for such cases, and it also had charge of asylums for insane and of the men in the nervous and mental wards in the military hospitals.

The Division of Surgery classified the surgeons in the Medical Reserve Corps — continuing the code card system begun by the General Medical Board of the Council of National Defense — trained them in special schools, assigned them to posts and distributed instruments and supplies at such posts. Military surgery was largely revolutionized during the war. Wounds were thoroughly operated upon as soon as possible after a man was hit, all lacerations and surrounding flesh being cut away and the danger of infection by tetanus or gas gangrene bacilli reduced to a minimum. Owing to modern methods of sterilizing infected wounds, of the wounded who survived six hours, 90 per cent recovered; of those who reached field hospitals 95 per cent recovered; and of those who arrived at base hospitals 98 per cent recovered. Paraffin compounds found favor with many surgeons as dressings for burns and scalds. The subdivision of military orthopedic surgery dealt with the correction of deformities resulting from wounds and injuries, and supplied standardized splints, artificial limbs and similar appliances. This section paid particular attention to soldiers' feet and the shoes they wore and took measures to prevent and cure "trench feet," insisting upon properly drained trenches and prescribing loose, comfortable foot

and leg wear and nightly washing and greasing the feet (clean socks in abundance). Under its supervision were orthopedic work-shops for making plaster casts, artificial limbs, splints and other supplies incident to the correction of deformities.

The Division of Special Hospitals and Physical Reconstruction became of greater and greater importance as the war progressed. In addition to the separate hospitals for the tuberculous and insane, special provision was made for groups of medical and surgical injuries, the blind and the deaf.

The Division of Surgery of the Head included four sections: ophthalmology, otolaryngology, plastic and oral surgery, and brain surgery. This division supervised the selection, classification and intensive training of medical reserve officers in brain surgery, specialized surgery of the mouth and jaw, and eye and throat. It standardized instruments and material and selected optical equipment for use at the front. Those in charge of this division were instrumental in perfecting methods for making artificial eyes to take the place of those previously made in Germany and were also responsible for devising excellent types of goggles for aviators. This division published a monthly magazine, *Survey of Head Surgery*, containing articles and abstracts of articles calculated to be of value and interest to military surgeons. Through the close teamwork of the oral surgeon, dental surgeon and dentist comprising each unit at the front, many unusual operations were performed during the war, in the repairing of portions of the face and jaw of men injured in battle, new features and jaws being supplied by the experts in plastic and dental surgery.

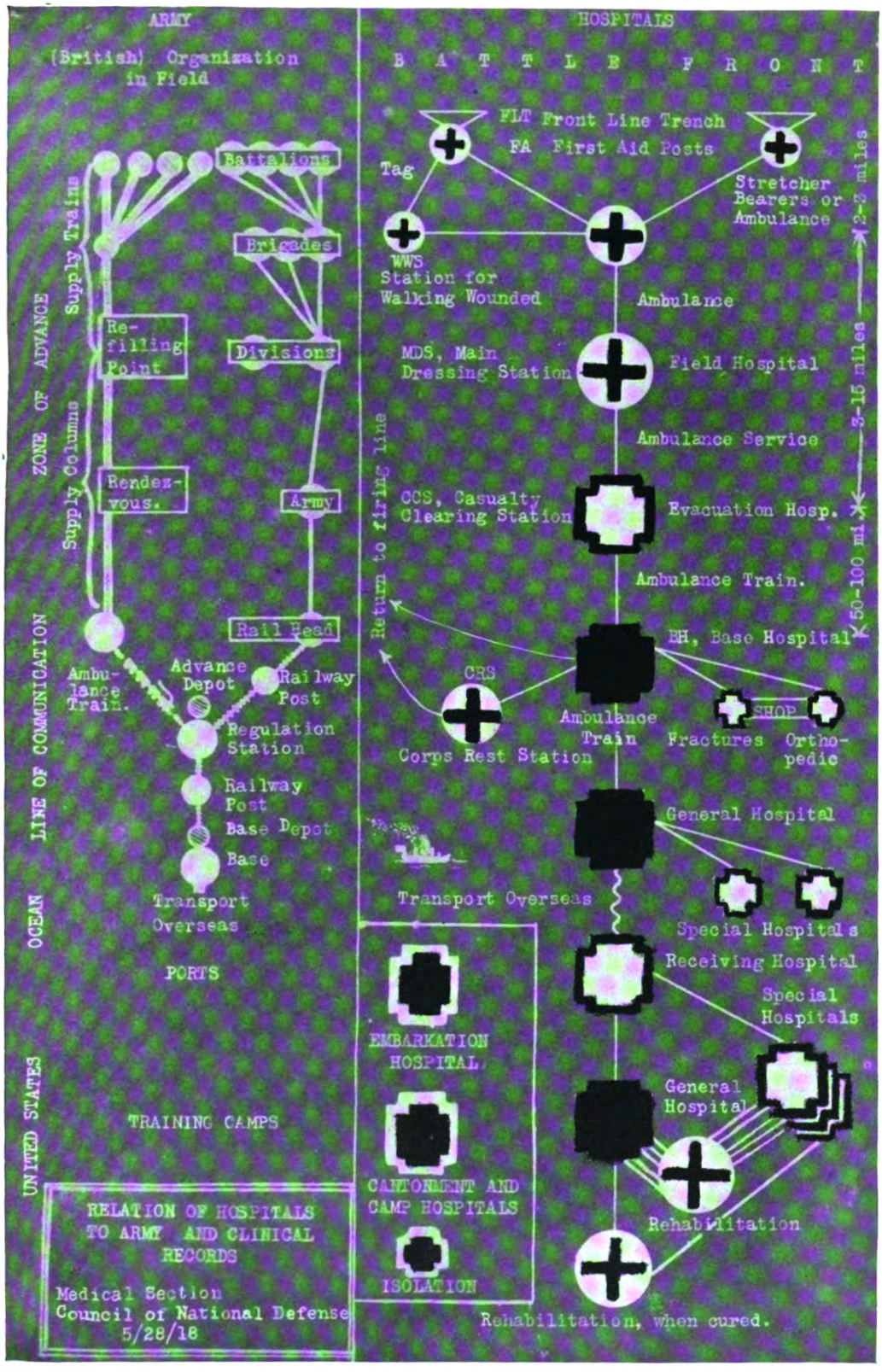
In general, the purpose of reconstruction was to return the injured man to complete or partial military duty or to his former occupation in civil life, or to train him anew in a curative workshop. This work of reconstruction in the American army was on a comprehensive scale. Individual study of each injured soldier was made and his repair attempted according to his best "social worth." No man was discharged from the army until every possibility had been exhausted to put him back in the best physical condition. Massage and various electrical appliances and mechanical devices were used in convalescence, to restore muscular movement in limbs and extremities, and artificial limbs were employed enabling the mutilated man to use all manner of tools and implements and to perform the daily functions of civilized life. The Division of Physical Reconstruction edited and the American Red Cross published a monthly magazine, *Carry On*, relating to phases of this important work.

The Division of Hospitals planned and organized all army hospitals, convalescent camps, depots and hospital trains, supplying all their personnel including specialists in surgery, medicine, bacteriology, epidemics, heart, head, nerves, feet and the more prevalent and dangerous diseases. Up to the entrance of the United States into the war, there were only seven army hospitals aside from post hospitals, these seven having a bed capacity of 3,843. Including the army post hospitals, the bed capacity was about 5,000. A survey of prospective needs led to requests for 86,472 beds and of these there were ready in March 1918, 48,632, and hospitals with capacity of 29,140 were under construction. Hospital requirements in the United States when 4,000,000 soldiers were expected in France were estimated at 200,000 beds by then Brig. Gen. Robert E. Noble of the surgeon-general's staff in late September.

The hospitals in the United States were of three types: (a) receiving hospitals at ports of debarkation, which are filled and emptied rapidly; (b) base hospitals, of which there were 44, including 32 at National Army and National Guard camps; and (c) general hospitals. Of the total of 79 hospitals established, 29 were equipped to care for more than 1,000 patients each, and 17 to accommodate 2,000 each.

The sending of large forces to France necessitated the establishment of a great medical and hospital organization under the medical officer on the staff of the general commanding the port of embarkation. This medical department, with headquarters in Hoboken, N. J., had jurisdiction over operations on the Atlantic coast from Canada to Florida and had on 31 July 1918, 33 medical department organizations, with 529 officers, 110 contract surgeons, 342 nurses, 2,649 enlisted men and 65 civilians. The divisions included those on personnel, correspondence, dental service, history and statistics, sanitary inspection, property, finance, transport supply, transport, transportation (with seven hospital trains and 23 ambulances), transatlantic transport service, medical detachment, overseas casualty camp, sick and wounded, medical supply depots, nurses' mobilizing stations, attending surgeons, laboratory (for pathological, bacteriological, chemical and microscopical examinations and analyses), hospital building and domiciliary hospital (in charge of convalescent hospitals in private homes, with capacity of from two to 50 patients each and a total of 1,200 patients) in addition to the hospitals. The 13 hospitals had 12,500 beds, of which 11,000 were ready for occupancy on 1 Oct. 1918. A man found sick in a unit about to go across was quickly sent to an embarkation hospital; when he recovered he went as a casual and probably was placed in a unit other than that to which he originally belonged. Embarkation Hospital No. 1, at Hoboken, had 763 bed capacity; No. 2, for scarlet fever, mumps and measles, was at Secaucus, N. J.; and No. 3, for communicable diseases, off Hoffman's Island, had 694 beds. On the Columbia University oval, Williamsbridge, New York City, was General Hospital No. 1, with 1,100 bed capacity; United States Auxiliary Hospital No. 1 (Rockefeller Demonstration Hospital, for demonstrations and carrying on scientific investigations), was at 66th street and Avenue A, New York City, and it had 150 beds; Port Newark Terminal, N. J., had a post hospital with 30 beds; the base hospital at Camp Merritt, Tenafly, N. J., had 1,846 beds; the base hospital at Camp Mills, Long Island, had 1,506 beds, and the hospital at Schützen Park, N. J., was planned for 400. At the debarkation hospitals the patients were sorted and sent to various special hospitals, sanatoria, restoration clinics or convalescent homes, throughout the United States. The debarkation hospitals were: No. 1, Ellis Island, 1,075 beds; No. 2, Fox Hills, Staten Island, 1,762 beds; No. 3 (Greenhut Department Store)

MEDICAL ORGANIZATION IN THE ARMY



Sixth avenue and 18th street, New York City, 2,814 beds; No. 4, Long Beach, L. I., 1,800 beds, and No. 5, the Grand Central Palace, Lexington avenue, 46th and 47th streets, New York City, rented for $385,000 yearly, with 3,300 beds.

The general hospitals, of which there were 27, were the only ones for troops returning from Europe. Twenty-two were in September 1918 completed, or nearly so. The total bed capacity in these general hospitals was about 20,000. It was planned to have one general hospital for each of the 16 draft districts of the country, distributed so that sick and wounded soldiers could recover near home. Orthopedic hospitals were established at Washington, D. C., Baltimore, Md., and Colonia, N. J. There were neuropathic hospitals at Fort Porter, N. Y., and New York City.

The surgeon-general designated the following 15 general military hospitals for the work of physical reconstruction: Walter Reed General Hospital, Washington, D. C.; General Hospital No. 2, Fort Henry, Md.; General Hospital No. 3, Colonia, N. J.; General Hospital No. 6, Fort McPherson, Ga.; General Hospital No. 7, Roland Park, Baltimore (for the blind); General Hospital No. 8, Otisville, N. Y.; General Hospital No. 4, Fort Porter, N. Y.; General Hospital No. 9, Lakewood, N. J.; General Hospital No. 11, Cape May, N. J.; General Hospital No. 16, New Haven, Conn.; General Hospital No. 17, Markleton, Pa.; Letterman General Hospital, San Francisco, Cal.; United States Army Hospital, Fort Des Moines, Iowa; Plattsburg Barracks Hospital, Plattsburg Barracks, N. Y.; General Hospital, Fort Bayard, N. M.

No man was brought to this side as long as there was a reasonable chance of his being able to return to the firing line. Eighty-five per cent of all wounded were returned to the firing line in a comparatively short time. Fifteen per cent of the total sick and wounded were not able to return to the firing line within six months and they were classified and tagged in France according to wounds, sickness and disease, all located on arrival on this side and sent by train to the various general hospitals. Of the 15 per cent brought to the United States, one-third were later capable of some kind of military service. Of these, some were sent back to the firing line or trained for limited military service.

Those disabled to the extent that they were unfitted for further military service, if it was deemed desirable, were fitted again for their former employment; or if their injury precluded or circumstances indicated that change of occupation would be to their advantage, they were encouraged to take advantage after discharge of the benefits afforded for vocational training by the Federal Board for Vocational Education, which had charge of the rehabilitation, generally, of this class of ex-soldiers and sailors. It was recognized that a small group was and will be unfit for any work.

It was estimated that about 1 per cent of the men mobilized would be subjects for vocation training; as the United States mobilized 4,000,000 men, there are 40,000 to retrain. Half of the men susceptible of recuperation need medical rather than surgical care. Of the 20,000 surgical cases, about 2,000 are "dismemberment" cases, where there has been actual loss of arm, leg, hand or foot. Of the 2,000, about 250 have lost legs, and about 175 an arm or arms.

There were seven hospital trains in the United States. Each train was in charge of a transportation officer. In each train there was a convalescent capacity for 250 patients, and a bed patient capacity of 30. The trains were provided with every convenience and there were several types of coaches, kitchen cars, dining cars and unit car for the staff. On occasion, special coaches were provided for disabled returning soldiers to be attached to passenger trains. There were six hospital boats, ready with picked crews and nurses.

Staffs of hospitals were administrative and professional. The commanding officer in charge of a general hospital was a colonel or lieutenant-colonel of the Medical Corps. He had, as adjutant, a major of the Medical Corps whose staff of 17 includes sergeant, privates and civilian employees. The registrar was a major or captain of the Medical Corps; he had a staff of nine sergeants and privates. The quartermaster was a major or captain of the Medical Corps; his staff of 61 included a captain or lieutenant of the Medical Corps (who was in charge of the hospital mess) and 60 sergeants, corporals and privates, and civilian employees. Officer of the day, officer of the guard and chaplain completed the administrative staff. Professional division — the chief of the medical service was a major and serving under him were two sergeants and two privates. The surgical service consisted of one major, one captain or lieutenant, one sergeant, four privates and five army nurses. In the wards there were 12 captains or lieutenants of the Medical Corps, 6 sergeants of the Hospital Corps, 70 privates, Hospital Corps, and 53 nurses of the Army Nurse Corps. In the laboratory there was a captain or lieutenant of the Medical Corps, a sergeant first-class, two sergeants and four privates, all of the Hospital Corps. The dental service was in charge of one lieutenant of the Dental Corps, who had one private of the Hospital Corps as assistant. The nursing service comprised one chief nurse, nine assistants and 53 nurses. One head nurse in each ward served eight hours daily and was on night duty one month in three. In each convalescent camp there was a captain or lieutenant of the Medical Corps and one sergeant first-class, one sergeant and six privates, all of the Hospital Corps.

The grade classification of the personnel of a general hospital was as follows: Twenty medical officers (1 colonel commanding, 1 major, operating surgeon; 18 captains and lieutenants, including quartermaster, pathologist, eye, ear, nose and throat specialist, 2 assistant operating surgeons, 12 ward surgeons, dental surgeon); 8 sergeants first-class (1 general supervisor, 1 each in charge of office, quartermaster supplies and records, kitchen mess, detachment and detachment accounts, patients' clothing and effects, medical property and records, dispensary); 16 sergeants (1 in dispensary, 2 in storerooms, 1 in mess and kitchen, 4 in office, 2 in charge of police, 6 in charge of wards); 14 acting cooks; 115 privates first-class and privates (68 ward attendants, 3 in dispensary, 5 in operating-room, 1 in laboratory, 14 in kitchen and mess, 6 in storerooms, 4 or-

derlies, 5 in office, 4 outside police, 1 assistant to dentist, 4 supernumeraries); 46 nurses, female (1 chief nurse, 1 assistant to chief nurse, 41 in wards, 2 in operating-room, 1 dietician).

A subsequent development necessitated by the war was the creation of mobile hospitals compactly contained in motors and susceptible of rapid setting up and, if emergency dictated, removal. A mobile hospital section, consisting of 14 motor trucks in charge of a chief surgeon and an assistant, with 20 to 40 enlisted men and 10 army nurses, remained near a base hospital about 15 miles back of the battle front. Summoned by telephone, the section proceeded forward with doctors and set up its operating tent, the construction of the motor trucks being readily adaptable to the formation of a compact hospital unit with electrically lighted plant, sterilizing outfit, X-ray apparatus and small frame operating pavilion. Two of the trucks carried tents and hospital supplies, the whole plant when erected making a temporary field hospital with 120 beds. Each mobile hospital had its own headquarters and staff — lieutenant-colonel, 2 captains, lieutenant and 3 enlisted men — in addition to the surgeons and men on call service. The main headquarters of the mobile hospital branch was in charge of a colonel and 5 chiefs of the surgical staff for 5 sections.

Hospital trains specially fitted and arranged for the comfort of the wounded were used in the theatre of operations to convey the wounded from the evacuation hospitals to the base hospitals. One of the American hospital trains in operation in France was 930 feet long and consisted of 16 coaches. There was a fracture ward and an infectious diesease ward, and the train accommodated 360 patients in cots, or 480 sitting down and at the same time 120 in cots, making 600. Each ward had 36 cots hung in tiers of three. The equipment was as complete as that of any hospital in the United States. The staff of the train included 3 medical officers, a manager, 2 lieutenants, a sergeant first-class, 2 sergeants, 2 cooks and 31 enlisted men. Operating-room, kitchen, pharmacy, stores and staff carriages were also provided.

Hospitals for prisoners of war were located adjacent to prison camps and stockades.

The three hospital ships, the *Solace, Mercy* and *Comfort,* placed in commission, were originally 10,000-ton merchant ships. The *Mercy,* a typical hospital ship, carried 321 bunks for the sick, and it was possible to use space for 100 to 200 more by use of cots and Gosso beds. Every department found in a well-equipped hospital was provided and there were surgical, medical, genito-urinary, eye, ear, nose and throat, contagious and convalescent wards. Each department was presided over by a specialist with an assistant, regular or reserve force officers of the navy. There also were roentgenologists, laboratory men, dentists, 3 pharmacists, 8 pharmacists' mates and 3 trained male nurses. There was a library, and as recreation for convalescents, music was provided by a band and victrolas, and there were facilities for moving pictures. The ship was provided with 2 large ambulance motor boats, each accommodating about 16 stretchers.

Regulations provided that military hospital ships might not be captured while hostilities lasted, their names having been communicated to the belligerent powers before their use, but they might in no wise hamper the movements of the combatants. They were constructed or adapted specially and solely with the view to aiding the wounded, sick and shipwrecked. Each was painted white with a broad horizontal band of green.

The personnel of a hospital ship having 200 bed capacity consisted of 5 medical officers (1 lieutenant-colonel or major, 4 captains and lieutenants, 1 sergeant first-class, 4 sergeants, 5 acting cooks, 30 privates first-class, of whom 29 were nurses and 1 an orderly).

The Division of Roentgenology provided X-ray apparatus and trained specialists to cooperate with surgical units. The importance of the X-ray as the modern substitute for the probe was recognized and X-ray laboratories were established in hospitals in the United States and France. Mobile X-ray units also came into use. Each vehicle was a standard army ambulance with a few modifications, having complete X-ray equipment including a darkroom in which plates and films could be developed. It had its own power-plant distinct from the propelling engine of the vehicle. An X-ray ambulance in a road test traveled 900 miles to Hamilton, Ontario, for the meeting of the British Medical Association, averaging 24 miles an hour for the journey. About 50 such units were sent to France. The crew of each consisted of 1 officer and 3 enlisted men, all of whom had comfortable sleeping accommodations.

In the Air-Service Division, flight surgeons and physical directors were appointed, the corps being large enough to equip each training field and camp for fliers in the United States and in France, with a proper organization. The medical branch of the air service selected the fliers and looked after their care and condition, so as to reduce to the minimum accidents due to physical unfitness. The flight surgeon at a camp prescribed rest, recreation or temporary relief from duty. as the case required. He made sick calls on aviators, visited cases in hospitals and consulted attending physicians regarding these cases. Tests were conducted to determine effects of rarefied air upon aviators. The flight surgeon and the physical director, who is his assistant, lived in close touch with the fliers. The physical director supervised the recreation and physical training. For use in emergency at flying fields, there were ambulance air planes or flying ambulances — standard training planes with the rear cockpit cleared and enlarged sufficiently to permit of a combination stretcher seat to enable the injured man to be propped up and rest easily. These air ambulances were of value because of their speed, ability to reach places not readily accessible by automobile ambulance, and because they assured a gentle and comfortable journey. The flight surgeon and a skilled pilot went in the flying ambulance when emergency arose, the surgeon taking necessaries for first-aid and minor operations. Flight surgeons qualified as pilots whenever possible.

Army medical men used the results of chemists' research and modern invention to combat and overcome poison "mustard" gas and the various other scientific diabolical methods of warfare in which Germany set the pace. The Division on Gas Mask Defense (later placed under the Chemical Warfare Service,

a separate branch of the War Department) established schools in each camp, in which every officer and man was instructed in gas defense. A gas mask giving far greater protection than the German mask and at least equal to that used by any other army was devised and supplied to both the men and horses in the American forces. Special sections provided the masks, instructed in their use in daily drills and attended to repairs overseas. Soldiers were required to adjust masks in six seconds.

The Army Medical Museum and Library of the surgeon-general's office are important aids in the work of the Medical Department and instruction in military medical matters. The Museum, of which Col. William O. Owen was for many years the officer in charge, is operated for medical and scientific research and is a central clearing-house for pathological specimens. It contains the most remarkable collection of gunshot fractures in existence (from the Civil War), also laboratory workshops, art department, complete motion picture department. Pathological specimens from the front were assembled and exhibited here, and catalogued and co-ordinated with the corresponding clinical histories for investigation purposes. The library, which is really the National Medical Library, is a source of medical information to the Medical Corps and to the medical public in general. It is second only to that of the Paris Medical Faculty in number of volumes and is the most useful and valuable of all medical libraries in that it has the finest collection of medical periodicals in the world.

Here the *Military Surgeon*, the literary organ of the Medical Corps and of the Association of Military Surgeons, is edited and published. the surgeon-general passes on medical articles for publication by medical officers through the board of publications. Much valuable material bearing upon the Great War has already been issued with his sanction.

Records of health conditions, reports and statements of sick and wounded, and all manner of other data will be here available for the 'Medical and Surgical History of the War,' which is being compiled, to be published within five years after peace is declared. Medical and surgical material of value bearing on epidemics, group diseases or unusual surgical cases, were sent in by the base hospitals. The division after September, 1917, made tabular statements concerning the movement of preventable diseases, based upon periodic telegraphic reports made to the Division of Sanitation from the 31 separate cantonments. This compilation will be made a first installment of the history of the mobilization of the United States army.

The senior medical officer on the staff of the commander of a field army is a *chief surgeon;* the senior medical officer of the line of communication is a *surgeon*, base group; the surgeon in charge of the zone of the advance is a *division surgeon*, with the grade of colonel; of a brigade operating independently, *brigade surgeon;* of a detachment (regiment or small command), *the surgeon.* When guards from the line are detailed to sanitary formations and the commander of the guard is a commissioned officer, he confers with the medical commander as to the character of guard duty desired, but exercises no control over the sanitary formation. Guards may use their arms in self-defense or in defense of the sick and wounded. Field hospitals when not parked with divisional trains are ordinarily guarded by ambulance companies. All sanitary troops and armed detachments or sentinels detailed to guard sanitary formations, falling into the hands of the enemy do not become prisoners of war, but are disposed of under Article 12 of the Geneva Convention, 1906.

The mobility of an army is essential; therefore the Sanitary Service must operate efficiently, in such a manner as not to obstruct military operations, and with a minimum amount of transportation and personnel. In the Zone of the Advance the medical administration provides only emergency treatment and prompt transportation of the wounded to the rear, always with such disposition that men fit for duty are retained at the front and the fighting force relieved of the impediment incident to the presence of men incapacitated for duty. When battle impends, the resources of the Sanitary Service behind the Zone of the Advance are placed in readiness to meet the demands for the care and transportation of the wounded which may reasonably be expected, and personnel and supplies are advanced as near the seat of operations as practicable, reaching forward into the Zone of the Advance if conditions warrant it. The Sanitary Service of the Line of Communication (1) provides such facilities that the wounded may return to the front without delay; (2) furnishes prompt evacuation service so that the fighting forces will be promptly relieved of wounded and the Sanitary Service of the Zone of the Advance can keep in touch with their combatant organizations; (3) furnishes a system of supply to enable the sanitary troops in the Theatre of Operations to replenish equipment and supplies by direct method and without delay; and (4) maintains satisfactory sanitary conditions among the troops on the Line of Communication and, if necessary, takes charge of sanitation among the inhabitants of occupied territory.

The Ambulance Service supervises transportation of wounded from the first-aid stations to the base hospitals. On the march not in the immediate presence of the enemy an entire ambulance company may be placed with the advance guard. Ambulances of one or more companies may be distributed through the main body, an ambulance following each regiment or independent battalion; later, these join their companies. An ambulance company operates in two parts, with personnel at war strength as follows: (a) With the dressing station, including the litter bearers, with equipment on pack mules; four officers, one sergeant first-class, six sergeants, one acting cook, 40 privates first-class and privates — all of the Medical Department — and (b) with the wheeled transportation; one officer, one sergeant first-class, one sergeant, one acting cook, 28 privates first-class and privates (one as farrier, one as saddler, 20 musicians, 12 as ambulance drivers and 12 as ambulance orderlies) — all of the Medical Department; also, one sergeant (blacksmith) and three privates (drivers) of the Quartermaster Corps. Regulations provide that all ambulances, wagons, animals, hospital trains, ships and boats, with their personnel assigned to the Medical Department, shall not be diverted from the medical service. Supplies for the sick

and wounded are transported so far as possible by the medical superintendents of the Transport Service. For evacuation of the wounded to the rear, all transport available is pressed into service, including combat wagons, field train wagons, automobiles and other civilian transportation of all kinds.

While the organization of the Medical Department may logically be treated first with a general consideration of the various branches of the service and divisions of the surgeon-general's office, and with the successive steps taken in building the service from the interior to the battlefield, in considering the Theatre of Operations one must visualize the entire cone above the base, through the Line of Communication and Zone of the Advance to the very forefront of battle. And as casualties regularly pursue a course backward from the active front, consideration of medical activities in the Theatre of Operations may well be in this order.

The wounded man applies a dressing from his own first-aid or converts his belt or shoe lace into a tourniquet if able — or a comrade does it for him if he is incapacitated — when medical aid by a regimental medical orderly is not available. As the engagement develops, an Aid Station is established for each regiment as the number of wounded brought in by the field ambulance bearers warrant. (In many cases bandsmen are assigned to duty as stretcher bearers for first aid). The time and place for opening an aid station are determined by the organization commander, unless he has authorized the surgeon to use his discretion in the matter. In this case, the surgeon of each regiment, with the necessary equipment carried on a pack mule, establishes the station. The Aid Station is always in immediate touch with the combatant unit. The requirement that the sanitary personnel with combatant organizations keep in touch with those organizations may make it necessary for them to leave the wounded where they fall, pausing only to administer such aid as may be absolutely essential. In the case of mounted troops, the sanitary detachment accompanies troops during the whole course of the engagement, pausing only long enough to render first aid and to collect the wounded at a place where they can be turned over to an inhabitant to be cared for. Cases left behind will be collected and cared for by the dressing station party as it advances. In some cases dressing station and aid station are located together. Treatment at the Aid Station at which the wounded are originally assembled by the Sanitary Service is usually limited to first-aid and to readjustment of dressings, with sometimes an emergency operation. During and after an engagement diagnosis tags are attached to all wounded (and also the dead) as soon as practicable; they are made out in duplicate. At these stations the Sanitary Service with the troops connects with the service of the sanitary train. Men with trivial wounds are sent back to their commands when the wounds are dressed. Those slightly wounded but able to walk are directed to the station for slightly wounded, several miles in the rear, so that dressing stations and field hospitals may not be congested unnecessarily. If time has permitted the installation of a more elaborate system, the wounded may be taken by trolley from the trench first-aid station through a communicating trench to the Advance Dressing Station; otherwise they are taken on hand-stretcher or perambulator.

Each ambulance company establishes a dressing station (or field ambulance) in a protected location, usually some distance in the rear of the aid station (in trench warfare about 400 yards from the front trench) and an advanced surgical post adjacent, where urgent operations under bomb-proof are performed. The number and location of dressing stations are determined by the division surgeon, acting under instructions of the division commander, and the director of ambulance companies supervises their opening. At these dressing stations light nourishment is provided, dressings are examined and adjusted, splints applied, antitetanus serum injected, morphia tablet given if the man is suffering acutely, and an iodine cross marked on the forehead to show that this attention has been given. Patients requiring transportation are made as comfortable as possible until it is practicable to transport them by horse litter to the advanced surgical aid post, or by ambulance — possibly by motorcycle with two-story side car — to the field hospitals. The site for a dressing station should have the advantages of protection from rifle fire and from direct artillery fire, accessibility for wheeled transportation (motor transport if possible) and a supply of water. There are five departments: dispensary, kitchen, receiving and forwarding, slightly wounded, seriously wounded. As soon as a dressing station is opened, bearers proceed under the direction of a medical officer to the front as far as the enemy fire permits. Ordinarily they will be divided into as many sections as there are aid stations, and each section under a noncommissioned officer will proceed toward an aid station. These men direct wounded able to walk to the station for slightly wounded, and they transport other wounded from the aid station to the dressing station. As soon as the line of evacuation of the wounded is determined, ambulances are brought to the dressing station; they must arrive as early as possible, even at the risk of losses. Quickly loaded, they carry wounded from the dressing station to the nearest field hospital. The system may also include transportation by narrow-gauge railroad from the advanced surgical post to the field hospital, man-power push-carts being used.

If the wounded man arrives at the field hospital in good condition, he is not unloaded but is sent on to the evacuation hospital. The field hospitals generally have only a limited equipment, no beds or cots, but straw over which blankets are spread, and aim to provide shelter, nourishment and emergency treatment. The mobile hospitals coming into use are fully equipped. Field hospitals are placed one to three miles in the rear of dressing stations, and care for the sick and wounded of the division until the sanitary service of the line of communication takes charge of them. The stopping of hemorrhages, cleansing of wounds and such emergency operations as will permit the removal of the wounded to the rear are performed here. The field hospitals are in charge of a medical officer with the rank of major, designated as director of field hospitals. The field hospital personnel includes a major (commanding); five captains and lieutenants (one

of whom is an adjutant and quartermaster and four are ward surgeons); three sergeants first-class (one acting first sergeant in general supervision of the hospital and in charge of medical property and records; one in charge of transportation and quartermaster property and records; one in charge of mess supplies and cooking); six sergeants (one in charge of dispensary, one in charge of operating equipment, one in charge of patients' clothing and effects, three in charge of wards); three acting cooks; 55 privates first-class and privates (45 attendants, one dispensary assistant, one artificer, four orderlies, three supernumeraries), and of the Quartermaster Corps, one sergeant (wagonmaster) and seven privates (drivers).

The regimental camp infirmaries and the four ambulance companies are all in charge of one major, designated as director of ambulance companies. He makes frequent inspections, supervises the removal of wounded and directs the opening of dressing stations and advanced surgical posts. He is assisted by a sergeant and a private first-class or private, hospital corps, both mounted.

The evacuation hospital (casualty clearing station) has been styled the keystone of the military hospital system. It is the first sanitary unit in which provision is made to retain patients for any length of time, and it is in the evacuation hospital that the great mass of rapid war surgery is done. Evacuation hospitals are often located in pairs and occasionally with special hospitals for shock and head cases in connection. They are from 5 to 10 miles from the front, but as near up as possible and on good roads, often on railroads. But all their equipment is light and mobile, so that it can be quickly removed if the exigencies of the conflict require. They have facilities for X-raying, the location of the foreign body being indicated by an indelible cross on the patient's skin. Teams of expert young surgeons perform the operations in these units, and these surgeons get 90 per cent primary healings in war surgery. It is a rule that no war wound that is to pass out of the control of the operating surgeon before it is healed is to be closed primarily. If operation is deferred, wounds are thoroughly cleansed and packed with gauze soaked in Carrel solution, the entire area is wrapped in compresses, solidly bandaged, strapped or splinted, and the patient is ready to be shipped 100 miles. In some cases an evacuation hospital is pushed forward and takes charge of the patients in the location of the field hospital. In other cases vehicles from the advance section of the line of communication are sent forward to the field hospital to receive the patients, and in many cases the trucks going to the rear for supplies will transport the patients back to the refilling point, where they will be turned over to the vehicles sent forward from the advance section. The evacuation hospital is equipped with cots, blankets and comforts, but ordinarily it will be cleared of patients as early as practicable in order that it may be ready to receive others from the front.

Between the evacuation hospitals and the base group there are rest stations and Red Cross units comprising an intermediate group, the medical officer in charge being known as surgeon, intermediate group.

Patients usually are brought back by trains or boats to the base hospitals, where all possible comfort and facilities for their care are provided. The sick and wounded who will be able to return soon for duty will be retained in these hospitals rather than turned over to the service of the interior. These base hospitals are operated with methodical régime and have all facilities for substantial surgical work and to expedite convalescence. By far the greater proportion of the operations here are "civil surgery" as distinguished from "war surgery." The bed capacity in the rear of the zone of the advance is aimed to be adequate to care for 10 per cent of the total forces when troops take the field, with facilities for rapid expansion. One base or general hospital is established for each 500 beds to be provided. The base hospitals are centres of great medical activity. Often there are contagious disease hospitals in connection. Here are located medical supply depots, materials being accumulated here and sent forward as required. Here also are field laboratories and casual camps for sanitary troops. There are also Red Cross units. Sanitary inspectors having the rank of lieutenant-colonel, and who are assistants to the division surgeon, supervise the medical operations, with the surgeon, base group, in immediate charge.

FRANKLIN MARTIN, M.D.,
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MEDICAL PEDAGOGY. The theory of education in its application to medicine still is mostly traditional, like many of the subjects it includes, for the pedagogy of the great number of medical schools has no steady, carefully arranged and planned-for, fought-for, curriculum based on personal and educational psychology and knowledge of the modes in which a young (or old) person learns. Both the method and the curriculum at present are largely traditional, like much of medicine in general.

The origin of this method has a certain amount of historic interest. As every one knows, a century ago and less the becoming "doctor" received all that he knew of medicine before approaching his victims from long and intimate attendance on one or more, usually one, more or less successful practitioners. It was the same condition as obtained and is still in use in the study of the law, only here the young man was more dependent on his "preceptor" than in the case of the "reader" and the old judge in his law office. The remnants of this old preceptor-system, as late as the year 1900, say, were to be seen in the medical schools even in New York City.

Some of the more ambitious and some also of the more lazy students joined a tutoring or "quiz" class in each of the important subjects of the curriculum; they were vigorously quizzed once or twice per week and enthusiastically "crammed" before the carefully calculated examinations. Some students took in small classes, as many as six or eight of these private courses, and the cost of each ranged from $5 to $25 for a year's quizzing. The preceptor, usually a college-bred, successful, wide-awake practitioner, was often young, always energetic, was called a "quiz-master," and, much admired by his students (to whom often he gave much personal and social care and help), he was at

least tolerated by the colleges, already aware that their course was in a sad lack of recitational reviews. Not infrequently the instructors held private quizzes.

When systematic laboratory work developed, largely in the richer medical schools, and recitations began to be systematically held, this preceptor-system — employing a practitioner to be guide, philosopher and friend, as well as tutor — gradually disappeared, except as still maintained in or about all institutions of learning in some form or other. In this pedagogic respect, then, the medical school tends continually to imitate more and more successfully the didactic methods of the university, which, of course, are ancient.

"The requirements for admission to and graduation from colleges holding membership in the Association of American Medical Colleges are 14 units of high school work and two years (60 semester hours) of college work.

The High School Requirement.

	Units
(A) Required, 7 units.	
Mathematics (minimum 2 years, maximum 3 years), algebra and plane geometry	2
English (minimum 2 years, maximum 4 years)	2
One foreign language (minimum 2 years, maximum 4 years)	2
History and civics	1
Total number of required units	7
(B) Elective, 7 units.	
To be selected from the following:	
English language and literature (in addition to the required work)	1 to 2
Foreign languages, additional, Latin, German, Italian, French, Spanish or Greek (not less than 1 year in any one)	1 to 4
Advanced mathematics, advanced algebra, solid geometry and trigonometry (½ year each)	1
Natural science, chemistry 1 year, physics 1 year, and biology, botany, physiology and zoology (½ to 1 year each)	½ to 2
Earth science, physical geography, geology and agriculture (½ year to 1 year each)	½ to 1
Astronomy (½ year)	½
Drawing (½ to 1 year)	½ to 1
History, ancient, medieval and modern, and English (1 year each)	1 to 3
Economics (½ year)	½
Manual training (1 year)	1
Bookkeeping (½ to 1 year)	½ to 1

One unit in any subject is the equivalent of work in that subject for four or five periods per week for a year of at least 36 weeks, periods to be not less than 45 minutes in length. One unit is equivalent to two semester credits or two points.

Premedical College Course.

SCHEDULE OF SUBJECTS OF THE TWO-YEAR PREMEDICAL COLLEGE COURSE.

Sixty Semester Hours* Required

	Semester Hours
Required Subjects:	
Chemistry (a)	12
Physics (b)	8
Biology (c)	8
English composition and literature (d)	6
Other nonscience subjects (e)	12
Subjects Strongly Urged:	
French or German (f)	6–12
Advanced botany or advanced zoology	3–6
Psychology	3–6
Advanced mathematics, including algebra and trigonometry	3–6
Additional courses in chemistry	3–6
Other Suggested Electives:	
English (additional), economics, history, sociology, political science, logic, mathematics, Latin, Greek, drawing.	

* A semester hour is the credit value of sixteen weeks' work consisting of one lecture or recitation period per week, each period to be not less than 50 minutes net, at least two hours of laboratory work to be considered as the equivalent of one lecture or recitation period.

Medical Curriculum.

DIVISION 1.— ANATOMY, 720 HOURS (18 PER CENT).

	Hours	Lect. Rec. Dem.	Lab. Wk.
(a) Gross anatomy (including applied anatomy)	510	120	390
(b) Histologic and microscopic anatomy	135	30	105
(c) Embryology	75	30	45

DIVISION 2.— PHYSIOLOGY AND CHEMISTRY, 600 HOURS (15 PER CENT).

	Hours	Lect. Rec. Dem.	Lab. Wk.
(a) Inorganic chemistry	180	60	120
(b) Organic chemistry	75	30	45
(c) Physiologic chemistry	104	30	75
(d) Physiology	240	140	100

DIVISION 3.— PATHOLOGY, BACTERIOLOGY AND HYGIENE, 450 HOURS (11.25 PER CENT).

	Hours	Lect. Rec. Dem.	Lab. Wk.
(a) Bacteriology	135	30	105
(b) Hygiene and general dietetics	45	45	
(c) Pathology	270	60	210

DIVISION 4.— PHARMACOLOGY, MATERIA MEDICA AND THERAPEUTICS, 240 HOURS (6 PER CENT).

	Hours	Lect. Rec. Dem.	Lab. Wk.
(a) Pharmacology	105	40	65
(b) Materia medica and pharmacology	80	..	..
(c) Therapeutics	55	..	..

DIVISION 5.— MEDICINE AND MEDICAL SPECIALTIES, 970 HOURS (24.25 PER CENT).

	Hours	Lect. Rec. Dem.	Lab. Wk.
(a) General medicine (including clinical microscopy)	640	..	..
(b) Pediatrics	150	..	..
(c) Nervous and mental diseases	105	..	..
(d) Jurisprudence, ethics and economics	30	..	..
(e) Dermatology and syphilis	45	..	..

DIVISION 6.— SURGERY AND SURGICAL SPECIALTIES, 720 HOURS (18 PER CENT).

	Hours	Lect. Rec. Dem.	Lab. Wk.
(a) General surgery	510	..	..
(b) Orthopedic surgery	45	..	..
(c) Genito-urinary diseases	45	..	..
(d) Eye	60	..	..
(e) Ear, nose and throat	60	..	..

DIVISION 7.— OBSTETRICS AND GYNECOLOGY, 300 HOURS (7.5 PER CENT).

	Hours	Lect. Rec. Dem.	Lab. Wk.
(a) Obstetrics	195	..	..
(b) Gynecology (including some abdominal surgery)	105	..	..

Colleges may reduce the number of hours in any subject not more than 20 per cent, provided that the total number of hours in a division is not reduced. Where the teaching conditions in a college are best subserved, the subject may be, for teaching purposes, transferred from one division to another. When didactic and laboratory hours are specified in any subject, laboratory hours may be substituted for didactic hours.

NOTE.—At the 1916 meeting the Committee on Education and Pedagogics was instructed to revise this curriculum to meet the present requirements.

Women in Medicine.— During the past year there were 581 women studying medicine, or 29 less than last year, but 15 more than in 1916. The percentage of women to all medical students is 4.3, a percentage approximating those of previous years. This is true also in regard to women graduates. There were 106 women graduates this year, 47 less than last year and 28 less than in 1916. Of all the women matriculants, a smaller percentage were in attendance at the two medical colleges for women, while 511 (87.9 per cent) were matriculated in the sixty coeducational colleges. From the two women's colleges there were 12 graduates while 94 secured their degrees from coeducational colleges. This increase of women students in coeducational colleges is not surprising, since in recent years some of the largest and oldest medical schools, as Columbia, Tulane, the University of Pennsylvania and Harvard (and McGill University in Canada), have thrown open their doors to women." (*Journal American Medical Association*, Vol. 7, No. 7, 17 Aug. 1918).

but they seldom have any knowledge worth while concerning educational theory. An assistant or teaching fellow in almost any university department of education would be of more use in a really conscientious medical school than the wealthiest and most dignified of these committees.

The principles of pedagogic fatigue, of overwork, and of under-recreation are ignored in most medical schools, with a consequent great waste of mental energy. As has already been hinted, the medical student needs normal recreation as much as any other student, if not more. A course in the economics of learning should be given in the first semester of every medical freshman year.

This suggests medical psychology in general. The everyday psychology of the emotions, for example, especially in relation to the functions of the body and its growth, should be studied and even understood by every medical man while yet a student. The present writer happens to be one of the early ones to say this, namely in *Science* in July 1901. Medical psychology was offered year after year, the Tufts College 1901–02 catalogue-announcement of this pioneer course being as follows: "*Normal medical psychology* — An optional course in normal medical psychology will be given to the fourth-year class in weekly lectures during the first half-year. Its aim is to discuss in their more general relations certain topics of great practical importance to the medical practitioner: such topics for example as suggestability and hypnosis, temperament, mood, the numerous habits, sexual mental differences, will-power, the emotions, pain and pleasure. Knowledge of subjects such as these prepares the student better to understand his patient as an individual and so better to treat his disease. But, in addition to this, the chief value perhaps of such information, the lectures will afford a brief basis of general psychology, which will tend to make the mental phenomena of the diseases of the mind and nervous system more easily understood" (Professor Dearborn).

WOMEN IN MEDICINE.

YEAR	Total women students	Percentage of all students, both sexes	Total women graduates	Percentage of graduates, both sexes	Women's colleges	Students	Percentage of all women students	Graduates	Percentage of all women graduates	Co-ed. schools	Students	Percentage of all women students	Graduates	Percentage of all women graduates
1904	1,129	4.3	244	4.0	3	183	16.2	56	23.0	97	946	83.8	198	77.0
1905	1,073	4.1	219	4.0	3	221	20.6	54	24.5	96	852	79.4	165	75.5
1906	895	3.5	233	4.3	3	189	21.0	33	14.1	90	706	79.0	200	85.9
1907	928	3.8	211	4.2	3	210	22.6	39	18.5	86	718	77.4	172	81.5
1908	835	3.7	185	3.9	3	186	22.3	46	24.9	88	649	77.7	139	75.1
1909	921	4.2	162	3.7	3	169	18.4	33	20.3	91	752	81.6	129	79.7
1910	907	4.2	157	3.5	3	155	17.1	41	26.1	82	752	82.9	116	73.9
1911	680	3.4	159	3.7	2	134	19.7	36	22.6	74	546	80.3	123	77.4
1912	679	3.2	142	3.2	2	143	21.1	32	22.5	64	536	78.9	110	77.5
1913	640	3.8	154	3.8	2	138	21.6	33	21.4	55	502	78.6	121	78.6
1914	631	3.8	121	3.4	2	135	21.4	25	20.7	54	496	78.6	96	79.3
1915	592	4.0	130	3.7	2	116	19.6	38	29.2	53	462	80.4	92	70.8
1916	566	4.0	134	3.8	2	102	18.0	28	20.0	51	464	82.0	106	80.0
1917	610	4.5	153	4.5	2	81	13.3	29	18.9	56	529	86.7	124	81.1
1918	581	4.3	106	4.0	2	70	12.0	12	11.3	60	511	87.9	94	88.7

It is distinctly disclaimed that in the following remarks there is any intention of finding "fault" with the present and bettering methods of medical education. This mode of discussion is the most convenient one, that is all, for pointing out the present pedagogic status of "studyin' to be a doctor." It would be invidious to find fault with so good a system without offering something to replace it; ideally to destroy without immediately afterward reconstructing the plan in a better form; and it may frankly be said that no such reconstruction is contemplated in this little article, or even hinted at.

Many medical schools need, and as much as anything else at all, except it be finances, an adequate survey by some wise and practical professional educator — one who would point out, for example, some of the inconsistencies and the lack of co-ordination between the different courses. "Visiting" committees frequently try to demonstrate to chance readers of their reports their own personal importance,

herent materialism of the medical schools has begun to soften, without a doubt, and to-day some of the very best medical colleges realize practically that education, any kind of education, that has ignored the study of mind and motive and behavior is incomplete and false in quite the most fundamental kind of way. This common lack of adequate psychology, however, seems still to be the chief pedagogical defect of medical education — man is both mind and body.

Whatever just criticism may be made of American medical education, it still remains the best in the world, its monetary wealth having put it practically ahead even of the famous old schools of England.

GEORGE VAN NESS DEARBORN, M.D.,
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MEDICAL SCIENCE AND THE WORLD WAR. Army medical departments everywhere had, before the war, prepared for the treatment of surgically clean wounds made by modern fire-arms in distance engagements. The soldiers "First Aid" kit, with its sterilized dressings sealed from contamination, was expected to maintain this freedom of wounds from infection almost without exception. Aseptic wounds assure prompt and uncomplicated recovery. Serious injuries of important organs would still often be fatal, but all others, as a rule, would be followed by convalescence without delay or complication. These anticipations were sadly disappointed by the immediate recourse to trench warfare as almost the sole mode of conflict. In trenches recently dug in fields which had been under cultivation for hundreds of years, bacteria abounded and infections inevitably occurred. Two extremely fatal forms of infection, tetanus and gas gangrene, raged among the troops. Both of these were often fatal and the gas bacillus caused long illness and often extensive mutilation, even when recovery took place. Tetanus, after the early sad war experience, was prevented by injections of anti-tetanus serum as soon as the wounded came under observation, the injections being repeated at regular intervals if convalescence from the wound was prolonged, for it was found that delayed infections occurred. The gas bacillus proved a much more difficult problem because of the utter unfamiliarity with it at first. It was unknown in Great Britain before the war, was not seen during our Civil War, and is very rare in civil life. Some 70 per cent of the wounds received in the trenches during the first year of the war were infected by it. It was never noted in wounds of the face or neck where the blood supply is abundant and the tissues well oxygenated, for the bacillus of it, discovered by Welch at Johns Hopkins, like the tetanus bacillus, is anerobic, that is, grows best out of the presence of the air. The successful methods of treatment included thorough opening up of wounds, the use of hydrogen peroxide, so as to provide additional oxygen for the tissues, and after careful investigation, the use of serums for curative and prophylactic purposes, elaborated by various agencies.

The large number of badly infected wounds to come under treatment proved very discouraging to the surgeons at first and iodine was found so valuable that it was used in large quantities until it was suggested that this would be known in medical history as "the Iodine War." The noteworthy difference between the healing of the wounds of soldiers and sailors led to an important development in the treatment of large shell wounds and penetrating wounds of various kinds in which foreign particles were carried deeply into the tissues. Soldiers thus wounded in the trenches suffered almost invariably from septic developments, often fatal and always with a protracted convalescence. Months after a bad shell wound, a soldier, if he recovered, would only be past the border line of danger, while sailors with similar wounds would usually be entirely well at the end of a month. The sailors had often been subjected to exposure to cold sea water, sometimes for an hour or more after the reception of their wounds. The influence of salt water as an application to the surfaces of large wounds was studied and it was found that when of about the specific gravity of sea water, it caused a pouring out of serum and a consequent cleansing of the wound by the discharges. Besides, the blood serum was distinctly bactericidal and the outward current set up carried off septic materials which would have been serious if allowed to remain. Mainly through the observations of Sir Almroth Wright, salt water was used extensively as a dressing for wounds, with some excellent results, and the principle is evidently to be of service after the war.

The important development in the treatment of wounds came when Dr. Alexis Carrel of the Rockefeller Institute was put in charge of a French hospital in Compiègne during the second year of the war. He set about the practical application of Lister's principles. Ordinary surgical antiseptics were too poisonous to be used for the flushing out of large wounds. A solution of hypochlorites proved to be bactericidal, yet non-toxic and non-corrosive to tissues. After experiment, Dakin's fluid, so called from the inventor of it who had been the director of the Herter Chemical Institute, New York, was found the most efficient solution of the hypochlorites. The important part of this treatment was the bacteriological control. After removal of all foreign particles and all injured tissues, wounds were thoroughly flushed with Dakin's fluid many times a day, until it was found by careful microscopic examination that the secretions contained very few bacteria and none to be feared. The wound was then closed up and permitted to heal without further interference. The results were excellent. Healing took place rapidly as a rule, convalescence was brief and absorption of septic material so as to produce constitutional disturbance rare and without danger. The after result was better than that produced by any other method and the hospitals where it was employed took on a new aspect from that which had been seen in the war hospitals before.

The most important development of the surgical treatment of war wounds has been what is called by the French *débridement*, that is the thorough excision of all injured portions of tissue. The extent to which this clearing out of the wound was carried in war practice would have seemed utterly unjustified in civil surgery before the war. Where a penetrating bullet wound shows signs of infection, a cylindrical

portion of the tissue around it is removed. In larger shell wounds, a layer of injured tissue is, as far as possible, removed from every portion of the wound so as to present perfectly fresh vital surfaces for healing purposes. Large amounts of tissue are thus often removed, for experience has shown that it is in the end ever so much better for the patient. Any injured cells allowed to remain are of low resistive vitality, have a tendency to die and then break down into material which forms an excellent culture medium for microbes. Where drainage is instituted, most of this will come away, but that is a much slower process and much more exhausting to the patient, and lowers the healing qualities of the part. It has been found by actual bacteriological observations that while very few bacteria are present shortly after the wound is infected, these multiply rapidly in the brood chamber created for them in the tissues, on the good medium for growth, while the healthy cells are handicapped by the presence of injured cells in their struggle against bacteria.

The war's experience with head injuries has developed a mode of treatment quite different from that in common use before. The surprise for military surgeons has been the wonderful tolerance of the brain to injuries. It was not an unusual thing to have wounded soldiers come into dressing stations as «walking cases,» who were suffering from fracture of the skull, even complicated by other injuries. The best surgery for these cases has proved the greatest possible limitation of intervention. Depressed bone fractures must, of course, be lifted, but missiles should not be searched for. There is least danger for the patient when the missile is left *in situ*, unless symptoms directly traceable to its presence develop. As a rule, antiseptic rather than aseptic precautions are most valuable in saving lives in these cases. The experience of four years seems to indicate that the after effects of the retention of foreign bodies within the skull does not justify manipulations in reaching them.

The use of poison gas has given rise to the most unsatisfactory medical feature of the war. In spite of the German signature to The Hague Convention article condemning the use of gas, the Germans proceeded to employ this mode of attack and found the Allies and the medical departments unprepared for it. At first heavy gases containing mainly bromine were used, favoring winds carrying them. Later gas hand grenades were employed. These gases had an intensely irritant effect and produced suffocation or were followed by severe purulent bronchitis. Pulmonary edema often proved fatal. Gas masks overcame this mode of attack. Then long range gas shells were employed, sometimes with delayed action, so as to lull against precautions. At times, shells containing «sneezing» or «vomiting» gases were used for the displacement of masks. In the last phase of the war, «mustard gas,» said to be chemically dichlorethylsulphide, was employed. It was persistent and would hang about for hours and make dugouts perilous for days. It burned the skin, and clothes moistened with it produced escharotic effects. Many of the most important German advances were made by means of these gases as a preliminary. The Allies learned to neutralize and reply effectively to all of them.

When the gas was not concentrated enough to produce suffocation or set up fatal pulmonary edema, the men usually recovered, though many of them went through a period of awful discomfort which was, of course, the reason why the use of gas was forbidden at The Hague. Comparatively few of those who survived presented serious lung lesions, though they had to be treated by the open air method, as for tuberculosis, as much as possible. We have learned from tuberculosis how tolerant the lungs are of even severe pathological conditions and how readily, after a time, compensation is secured. The question whether gasing predisposes to tuberculosis has been settled in the negative, though undoubtedly in certain cases latent foci of tuberculosis were made active by the process.

Comparative mortalities from wounds and disease in modern war show what a great gain was made by surgery and sanitary science in the war. In the Russian campaign against Turkey in 1828, some 80,000 died of disease and about 20,000 of wounds. In General Scott's campaign in Mexico the deaths from disease were over 33 per cent of the effective strength. In the Crimean War, out of a total force of 300,900, the French lost by disease 75,000 and by wounds 20,000. In the Prussian war against Austria, of but seven week's duration, the losses by disease were 6,427 and by wounds 4,450 in an army of 437,000. In the Spanish-American War 2,565 deaths were from disease and 345 deaths from wounds, in an army of 274,717. In the South African War the deaths from disease were 69 per thousand strength; from wounds, 42 per thousand. In the Russo-Japanese War the deaths from disease were 41.8 per thousand strength and from wounds 72.9 per thousand strength, the ratio for the first time reversed. Out of 300,000 dead in the Civil War, in the armies of the North over 200,000 were from disease. In the Confederate armies, of 200,000 deaths, three-fourths were estimated as due to disease and one-fourth to the casualties. (Figures furnished by the United States Surgeon-General's Office).

According to the 'Medical and Surgical History of the Rebellion' (Medical volume, part 1, pages xxv and xxvi), there were in the Northern armies altogether 235,583 gunshot wounds with a resulting mortality of 33,653 or 14.2 per cent. These figures represent the total returns from about nine-tenths of the mean strength of the Union army and exclusive of the injuries of those killed in action. In the late war, so far as the figures are available from the beginning, the deaths from wounds, that is of all those who came to the surgeons alive, no matter how badly wounded, have been calculated to be less than 5 per cent. This is, of course, merely an approximation but made on reasonable grounds. Exact figures will not be available probably for some time. The serious infections with tetanus and the gas bacillus at the beginning of the war make the available statistics much worse than would otherwise be the case. With the control of these the mortality among the wounded in the closing phase of the war was probably below 3 per cent.

The health of army camps at the beginning of the war was most satisfactory. As Doc-

tors Vaughan and Palmer said in their article on "Communicable Diseases in the National Guard and National Army of the United States" (*Journal of Laboratory and Clinical Medicine,* August 1918), "Preventive medicine has made it possible to prevent half a million cases of disease and save the lives of ten thousand soldiers," and they give the figures from the Civil War and the recent war for corresponding six months to show the truth of this. The improvement has affected every form of infectious disease. There has been only about one-tenth as much mouth and throat inflammation, less than one twenty-fifth as much intestinal trouble, not one-hundredth as much fever. Malaria, which even in the Northern army was extremely common, has now become a negligible morbidity factor and the mortality from tuberculosis and pneumonia is more than cut in two.

The sad epidemic of influenza proved that it was not the general hygienic conditions that brought improvement but the specific sanitary precautions against particular diseases. Unprepared for influenza in this virulent form, it raged very seriously, while the well-known camp diseases were kept entirely under control.

Typhoid or enteric fever which has played such a fatal part in all previous wars, carrying off in the Spanish-American War more than five times as many as the bullets of the enemy and in the Boer War causing ever so much more havoc among the British than the Boers did, has had almost no place in this war. The reason was better sanitation and careful provision of uncontaminated water with the guarding of latrines from flies and other insects that might find their way afterward to food, but above all, the typhoid immunity of the armies was due to typhoid vaccination, that is the inoculation of the soldiers with cultures of typhoid germs prepared under conditions that produced immunizing results. There is no doubt at all that this is the genuine source of the great saving of life that has been effected. The inoculations cause almost no disturbance of the general health,—soldiers have gone into battle the same day,—and only rarely have any serious effect. It is evident that in civil life travelers in distant countries or to parts of the country of whose sanitation they are not sure, will take such vaccinations against typhoid as a protective.

Trench fever was an affection peculiar to this war and replacing typhoid fever somewhat in its ravages among the soldiers. The men came down rather suddenly with a considerable degree of temperature lasting for from three to seven days, gradually disappearing and causing a great deal of prostration. After some days of normal or sub-normal temperature, the fever occurs again and the relapsing character of the affection has been quite marked. Careful investigation has shown that the disease is distributed through the body lice which have proved such a pest to the soldiers under the very difficult conditions as regards cleanliness to which they have been subjected. The discovery has made possible the prevention of the spread of the disease to a great extent, while the segregation of the relapsing and chronic cases in camps by themselves under favorable conditions of health has brought about such a reaction as has enabled the patients to throw off the disease. The study of trench fever, its etiology and its successful treatment as well as prevention, has been one of the triumphs of the war.

The great medical surprise of the war was the development of a large number of cases of a very severe form of functional nervous disease. Men lost control of themselves completely, very often had disturbances of the special senses,—deafness was rather common, blindness not so frequent,—and sensory disturbances of other kinds, with mutism and tremor or paralyses of various kinds, were noted. At first a great many of the cases were set down as forms of insanity and the patients were sent to insane asylums, but after careful study the purely neurotic character of the affection was determined. The cases were called "shell shock" and unfortunately, early in the war were grouped under this term, besides the neurotic cases, a number of latent injuries to the central nervous system, as from actual wounds by minute particles of shells at high velocity, severe concussions and the like. It was thought for a time that the intense compression of the air with immediate release near an exploding shell caused air at high pressure to be given off from the blood, leading to rupture of capillary arteries of the central system or other definite physical lesions resembling those of caisson disease. The prompt and complete recovery of many serious cases under proper treatment contradicted this theory and made it clear that there must be no organic basis. The term shell shock was suggestive of something much more than a psycho-neurosis, which the affection really was, and the term *nervousness,* the word sick or wounded in parentheses being added to the diagnosis "according to the external conditions to which the man was exposed at the time of breakdown," was suggested for it. This would have been a much better term but the original name maintained itself, as so often happens. The condition was entirely due to an emotional storm with loss of control over nerves, and nothing else. Its importance will be readily appreciated from the fact that during the first half of the war, one-seventh of all the discharges from the British army, or one-third of the discharges if those from wounds were not included, were for "shell shock." It was four times as prevalent among officers as among men. Cowardice was excluded as the basis and there was no malingering, except in cases readily recognizable. The study of the affection has thrown great light on the psycho-neuroses of civil life and above all has been valuable in the matter of treatment.

These patients need special treatment in special hospitals. In ordinary military hospitals, surrounded by sufferers from actual physical conditions, they are the subject of unfavorable suggestion and little incentive to get well. They must not be kept under circumstances, either at home or in hospital, where much sympathy is afforded them and their stories must not be listened to sympathetically, for they have the tendency of all neurotics to assimilate as their own, experiences gleaned from various sources. The first requisite of successful treatment is a careful examination which determines absolutely that no organic morbid condition is present. Then the patient must be given the feeling that his case is of no special signifi-

cance, but, on the contrary, is well understood and above all, has nothing exceptional in it. He must be made to understand that just as soon as the attending physician has the time to give to him, he will be able to remove his symptoms without delay. Three principles are insisted on in the methods of treatment. (1) suggestion, (2) re-education, (3) discipline. The aim of suggestion is to make the patient believe firmly that he will be cured and then after treatment that he is cured to stay so. Re-education overcomes the bad habit of lack of confidence that has been formed and discipline breaks down the psychic-resistance of the patient to the idea of recovery. For such symptoms as mutism or deafness, the patient is told that electricity will cure him and that as soon as he feels the current when the electrode is applied, his power of speech or hearing will be restored *pari passu*, with sensation. The same method is used for blindness and other sensory symptoms. Paralyses are favorably affected the same way, though tremors are harder to deal with. A cure in a single treatment is the best method, for the patient readily relapses unless he has been made to feel that he has recovered his powers completely and that it would be his own fault to permit his symptoms to recur. The cases partake of the nature of hysteria, though typical hysterical symptoms, crying, the making of curious noises, hysterical convulsions, are rarely seen at the front. The experience has made it clear that rest is nearly always an abuse in the treatment of such cases and inveterates the symptoms. The physical condition must be improved but the state of mind must be changed completely at once, if cure is to be effected.

A very interesting development of the treatment of these affections among the French, who had large experience, requiring over 20,000 places in their hospitals for the cases, was with regard to the value of severe discipline. In refractory cases, patients were put in solitary confinement without reading or writing materials or tobacco. This changed the mental attitude and helped to make counter-suggestion effective. In certain cases, strong Faradic currents were used which caused severe pain, so that patients who were mute had to scream out and those who could not use muscles were compelled to move them. Once it became known that treatment of this kind was being used, symptoms were much less persistent. The reason why the neuroses in officers were more difficult of treatment was that these measures were seldom employed on them. It became clear that the infliction of pain on a neurotic patient up to the point where he yields up his pathological suggestion is effective therapeutics. Some older severe methods of dealing with these cases which were condemned in our milder day are now justified by war discipline.

The surgical feature for which this war will be noted is the definite reconstruction work for the wounded which has been organized for the first time in history. Not only have artificial limbs and helpful apparatus of various kinds been provided, but the crippled have also been trained to do the work they are particularly suited for in their maimed condition. It has been found that some 95 per cent of those who lose an arm or hand can go back to their old occupations, while a very large proportion of those who have lost a leg can be trained to bench trades or given clerical or similar occupations which will make them thoroughly independent of assistance. Even with the loss of both legs, a man can be self-supporting. Indeed, the care exercised in training the crippled has resulted in a great many cases in giving them a better occupation in life than they had before. The temper of this aid has been such as to give men a hearty spirit of courage in facing life, so that they do not feel their handicap as an incubus, but on the contrary, are ready to do their bit in civil life as well as they did in war. The idea that they are crippled is not allowed to overcome them and the old custom of having begging cripples after the war is not to be allowed. Even the blind and the deaf are made self-supporting and at the same time given such occupation of mind as keeps them from being depressed. The effect of example on the part of some of the more courageous has proved a wonderful stimulus, so that though the war is to leave many maimed men, it is not going to create many helpless and the spirit of helpfulness does not provide useless sympathy and paralyzing charity, but just such encouragement as enables the men to help themselves.

Chronic affections of various kinds which have developed as a consequence of the war are being treated by the same far-seeing after-treatment that is given to the maimed. In a word, the soldier taken in health is either dismissed, after thorough examination, in as good health as before,—or usually much better,—or else he is given the advantage of scientific thoughtfulness and pre-vision in regard to his case, so as to restore him just as far as possible to his former usefulness as a member of the community.

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JAMES J. WALSH, M.D.,
Author of 'The Thirteenth Greatest of Centuries.'

MEDICI, mĕd'ę-chē or mā'dē-chē, a Florentine family who rose to wealth through commerce, became prominent in the affairs of the state, gained supreme power and were in general known as patrons of literature and art. GIOVANNI (1360–1429) rendered important service to Florence and became gonfalonier in 1421. His son, COSMO, the Elder (1389–1464), was called "Pater Patriæ," gained vast wealth, was a munificent patron of art and letters and combined statecraft with commercial enterprise. He was for 34 years the sole arbitrator of the republic and the adviser of the sovereign houses

of Italy. His grandson, LORENZO THE MAGNIFICENT (1449–92) governed the state in conjunction with his brother GIULIANO (1453–78) till the latter was assassinated by the Pazzi, a rival Florentine family. Escaping from this massacre he conducted a war with Ferdinand of Naples, with whom he signed a definitive peace in 1480. The rest of Lorenzo's reign was passed in peace and in those acts of profuse liberality and magnificent patronage of arts and sciences, in which he rivaled or excelled his grandfather. He left three sons — PIETRO (1471–1503), GIOVANNI (afterward Pope Leo X), and GIULIANO, Duke of Nemours. Pietro succeeded his father, but was deprived of his estates when the French invaded Italy in 1494. He finished his career in the service of France. His eldest son Lorenzo came to power by the abdication of his uncle Giuliano, who became Duke of Urbino. He died in 1519, leaving a daughter, the famous Catharine de' Medici (q.v.), queen of France. After several reverses in the family, Alessandro, an illegitimate son of the last-named Lorenzo, was restored to Florence by the troops of Charles V, and by an imperial decree was declared head of the republic, and afterward Duke of Florence. The next name of importance in the family is that of COSMO "the Great" (1519–74), in 1537 proclaimed Duke of Florence and afterward Grand Duke of Tuscany. A learned man himself, he was a great patron of learning and art, a collector of paintings and antiquities. FRANCISCO MARIA I, his son, obtained from the Emperor Maximilian II, whose daughter Joanna he had married, the confirmation of his title of grand duke in 1575, which continued in his family until it became extinct in 1737 on the death of Giovanni Gasto, who was succeeded by Francis, Duke of Lorraine. MARIE DE MÉDICIS (q.v.) (1573–1642), queen of France, was daughter of Francisco I. See FLORENCE; ITALY — HISTORY; LEO X, and consult Armstrong, Edward, 'Lorenzo de' Medici' (London 1896); 'Cambridge Modern History' (Vols. I and II, New York 1903–04); Fabroni, Angelo, 'Magni Cosmi Medicei Vita' (Pisa 1789); Heyck, Eduard, 'Die Mediceer' (Bielefeld 1897); Hyett, F. A., 'Florence' (London 1903); Horsburgh, E. L. S., 'Lorenzo the Magnificent' (London 1908); Meltzing, Otto, 'Das Bankhaus der Medici und seine Vorläufer' (Jena 1906); Roscoe, W., 'Life of Leo X' (5th ed., London 1846); id., 'Life of Lorenzo de' Medici' (10th ed., 1872); Ross, Janet, 'Lives of the Early Medici' (London 1910); Vaughan, H. M., 'Medici Popes, Leo X and Clement VII' (New York 1908).

MEDICI, Banks of the. The opulent house of Medici owed its origin, like that of the scarcely less wealthy house of Fuggers (q.v.), to the profits of the woolens trade, the progenitors of both houses having been weavers and dyers of woolen cloths, in their time the principal constituent of European garments; the cultivation of cotton and manufacture of cotton cloths being as yet monopolized by the Saracens. Schoenhof informs us that in 1422 Florence (under the Medici) had more than 70 banks, which by the year 1472 were merged or consolidated into 33. So important were these institutions to the Florentine republic, that they earned the sobriquet of the "Fifth Estate." The Medici had 16 banking houses in different European cities. (*Journal American Bankers Association*, September 1916). In the 15th century one of the Medicis was appointed treasurer to the Papal See; in the 16th century one of the Fuggers held the same high office. It is an interesting circumstance that the former became a Platonist, while the latter joined the Reformation. Lorenzo de Medici's appointment as treasurer was made by Sixtus IV in 1471; Huldric Fugger's, by Paul III about 1549. Both of these popes afterward assailed their appointees; but the banks they controlled and the important trades they financed rendered them too powerful to be easily overthrown. The Medicean banks received deposits of money for safekeeping, loaned the same out upon collateral, discounted commercial paper, issued bills of exchange, and traded in foreign coins and bullion. They possessed mints in Florence, Urbino, Barile, Pezza and other places, in which they struck their own coins, the series beginning in 1204, upon the fall of the Greek Empire, the dates in the old calendar being 10 years earlier. These coinages enabled the Medicean banks to make highly profitable exchanges of old coins and bullion at the various emporia in Europe and Asia which were brought within the circle of their commercial influence. Their earliest gold coin (the Florin) was struck in 1252, the series being issued by the gonfalionere (Standard-bearers) of the Republic of Florence until 1533, when they were struck by the Medici as dukes of Florence, afterward as dukes of Etruria. Maintained at their full legal weight (56 English grains, fine gold) the florins continued to be current in all the ports of Europe for centuries, their only rivals being the sequins or ducats of Venice. For the history of other ancient banks. See BARCELONA, BANK OF; BYZANTIUM, BANK OF; FUGGERS, BANK OF THE; GENOA, BANK OF; TYRE, BANK OF; VENICE, BANK OF.

MEDICINE, American Academy of. See AMERICAN ACADEMY OF MEDICINE.

MEDICINE, Eclectic, embodies the principles and practice of the only established American school of medicine. The term Eclectic was not the most fortunate, for at no time has it adequately defined the school's position. When chosen, the term was very popular and was borne by several education systems and books, and was moreover well known to the laity. The name American School of Medicine, as proposed by Dr. A. H. Baldridge, one of its pioneers, would have been more expressive, would have avoided misunderstandings and would have saved the school much criticism regarding its position among the existing systems of medicine. Eclecticism is the direct successor of the American Reformed System of Medicine originated by Dr. Wooster Beach of New York City in 1825. It should not be confounded with Thomsonism (Thomsonianism), or the doctrines of the steam and herb doctors, promulgated and practised in the early part of the 19th century by Samuel Thomson of New Hampshire, the peculiar theories of which the Eclectic school never adopted; the majority of the followers of Thomson being among their most bitter antagonists. In later years, however, many of the Thomsonians joined the Eclectic school and creditably assisted in up-

building it. The most successful organizer of the Eclectic school was Dr. Thomas Vaughan Morrow of Kentucky. The investigations in medical botany and materia medica by Schoepf, Benjamin Smith Barton, W. C. P. Barton, Constantine Rafinesque, William Tully and others gave an impetus to the movement which resulted in the establishment of the new school. The Reformed School of Medicine, by which name what was later denominated Eclecticism was first known, was organized in opposition to the drastic practice of the dominant school of medicine,— bleeding, blistering, and the abuse of the salts of mercury and antimony,— against which Eclectics, as well as the followers of Thomson and Hahnemann, protested. Instead of these barbarous remedies the reformer sought to substitute milder measures and to employ vegetable medicines whenever possible. Yet, in the light of the present the substituted practice of the early reformers would be regarded as but little less barbaric than that which they sought to supplant. The basis of Eclectic philosophy was the sustenance of the vital forces, the avoidance of depleting remedies, and the selection, as with the ancient Eclectics, of the best of remedies and means from all sources, even despising not the primitive medicines of the untutored American Indians. They did not rest contented, however, with merely "selecting the best"; they endeavored to improve on such selections. To the reformer the practice of the dominant school was cruel and inhuman, the remedies barbaric. Out of the common stock of remedies he chose those best suited to his purpose in what he believed to be a more humane practice. He looked forward to certain ideals and objects not in accord with the views and practice of the dominant school. For his presumption in thus opposing the authorities in medicine and by inaugurating unwelcome innovations he was branded an irregular; was ostracised by the self-styled regular physicians. An outcast, he was thus forced to organize a school in accord with his theories and practice.

There are three epochs in the history of Eclectic medicine,— the period of reformed medicine, from 1825 to 1845; the formative period, from 1845 to 1869, which was largely concerned in organization, and study of plant remedies; and the period of specific medication, from 1869 to the present, in which the best work of the school has been accomplished, and during which the theory of specific medication was promulgated and has been most largely practised.

The educational history of Eclecticism dates from 1825, when Dr. Beach privately instructed students at his clinic in New York, where, in 1827, he established an Infirmary, which in 1829, he expanded into the Reformed Medical Academy. In 1830 it assumed the more dignified title of the Reformed Medical College of the City of New York. It was well equipped and continued in operation until about 1838. Textbooks of a high order were prepared by Dr. Beach. A national society was formed and from this body an expansion movement was begun by the selection, in 1830, of Dr. John J. Steele as an agent to proceed westward and explore the towns on the Ohio River with a view to selecting an eligible site for a branch of the New York College. A circular of the society having reached Worthington, Ohio, Col. James Kilbourne, president of Worthington College, invited the promoters to establish their school in that town. Dr. Steele accepted and Drs. Thomas Vaughan Morrow and Ichabod Gibson Jones were sent to perfect the organization. The Reformed Medical Department of Worthington College, as this school was called, entered upon a successful career in 1830, with Dr. Morrow as the leading spirit, but lack of proper facilities, the machinations of enemies, internal dissensions, and the financial crisis of 1837 caused it to be suspended in 1842. Dr. Morrow next removed to Cincinnati, Ohio, and assisted by Drs. Lorenzo Elbridge Jones and Alexander Holmes Baldridge, at once organized the Reformed Medical School of Cincinnati. In 1845 this college was chartered by the State of Ohio as the Eclectic Medical Institute. From this time the term *Eclectic* has been employed to designate the system and its physicians.

The formative period of Eclecticism began with the chartering of the Eclectic Medical Institute in 1845 and ended with the introduction of specific medication in 1869. During this period large classes attended the Institute. *The Western Medical Reformer*, begun in Worthington in 1836 and suspended in 1838, was now revived and published as the *Eclectic Medical Journal*. Barring a brief half year suspension this periodical has continued to be published to the present time. In this period, Dr. John King, justly styled the father of modern materia medica, began the publication of his numerous textbooks, among which the 'American Dispensatory' gave the school an enduring and monumental work on materia medica. The pharmacy of the school advanced from crude drugs in powder, infusion and decoction past the resinoid and alkaloid distraction to improved galenicals. In this connection be it recorded that Professor King discovered and introduced the resins of podophyllum and macrotys, which together with the alkaloids of hydrastis and sanguinaria, were afterward prepared by Dr. William Stanley Merrell. These valuable agents together with the oleoresins of iris and capsicum attracted the attention of pharmacists. A host of indefinite compounds was added by others and the market was flooded with what purported to be Eclectic resinoids or concentrations. This heterogeneous class of pharmacals was denounced by Professor King and others who had sought to introduce only elegant and definite compounds. This much abused class of resinoids served, however, a temporarily useful purpose in the evolution of a more perfect materia medica. Of these preparations, only those made after the methods of Dr. King, and the alkaloids of hydrastis and sanguinaria have survived and singularly are now mostly employed by practitioners of the dominant school. During this period Eclectic colleges were established at Rochester and Syracuse, Louisville, Philadelphia, New York and Cincinnati. The majority of these were short lived and some of them had a strong leaning toward the system of botanic medicine now represented by the physio-medicalist. The Eclectic Medical College of Pennsylvania for many years in good repute, finally drifted away and during the later years (since 1871) was neither recognized by Eclecticism nor others. In 1856, a portion of the faculty of the Eclectic Medical Institute formed a rival college in Cin-

cinnati which had a large following. This school was absorbed by the Institute in 1859. The Civil War seriously threatened the educational progress of the cause and the withdrawal of a large quota of Southern students caused a marked shrinkage in the attendance at the Northern schools. Times were hard and the outlook gloomy. Dr. John Milton Scudder, a graduate of the Eclectic Medical Institute in 1856, now became the head of that institution. By strict business management he inaugurated a period of renaissance and Eclecticism soon became a recognized force in medicine in America. Specific medication, introduced by Dr. John M. Scudder in 1869, though at first vigorously opposed, is at present the basis of practice of fully three-fourths of the Eclectic physicians and is the leading therapeutic doctrine taught in all the Eclectic colleges. In fact modern Eclecticism is the practice of specific medication. Its theory is as follows:— Disease is a wrong or impairment of life. It is manifested clinically by certain well-defined symptoms. The totality of symptoms express a condition, to which, in the usual nosological classification, a special name is given. This disease name is of value only in the study of the natural history of diseases, for statistical data, for the purpose of recognizing contagious and infectious diseases, and for establishing a prognosis, certain necessarily fatal diseases allowing only of palliative treatment. The specific medicationist, like practitioners of other schools, pursues such a method of nosological diagnosis for the purposes named, but not as a guide to treatment, in which to him it is of little or no value. For therapeutic purposes he reverses this process and studies his case by analysis, not by synthesis, to discover, if possible, the varying conditions which make up the disease, as evidenced by specific and well-defined symptoms revealing disease expressions. Remedies have a certain force, and are definite in action. Like effects follow like causes. Hence, having found, by repeated experimentation, the opposing action of a drug in a certain condition of disease, as expressed by certain specific symptoms, objective or subjective, the same remedy will always relieve or cure like abnormal conditions. The believer in specific medication holds that there is a fixed relationship between drug force and disease expression.

The Eclectic has no specifics for *diseases* but specific remedies for specific conditions of such diseases. Specific diagnosis implies diagnosis to discover the condition curable by a certain remedy, as established by previous experimentation, and specific medication means the application of the known remedy for the pathological condition so found. Specific diagnosis is therapeutic, not nosological diagnosis. In practice the specific medicationist is guided in the selection of his remedy by "specific indications," as illustrated by the few following examples: The strong, excited, bounding pulse indicates veratrum viride; sharp, cutting or lancinating pain in serous tissues. bryonia; the full, oppressed pulse with a sensation of præcordial fulness and dyspnœa, lobelia; marked periodicity, with moist tongue, open pulse and freedom from nervous excitement, quinine; cadaverous odor of the secretions, potassium chlorate, etc.

The modern Eclectic recognizes no law of cure, and does not accept a remedy as a specific until the extended successful employment of it in some particular condition has given it the right to be so called. Empiricism and experimentation are the foundations of knowledge concerning each remedy denominated a specific medicine. The havoc wrought Eclectic pharmacy at the close of the formative period had now to be remedied. The school had been nearly shipwrecked on the shoals of commercial selfishness, as seen in the instance of the resinoids. Calamities often bring about future good, so in this instance the commercial mistakes of a few gave a renewed impetus to better the conditions of Eclectic pharmacy. Uncertain preparations were supplanted by definite medicines. As a result the school has now a materia medica and system of therapeutics much sought by the descendants of those who endeavored to block the efforts of the pioneer Eclectic, in his zealous contention for pure and representative medicines. Dr. Scudder, supported by Dr. King and others, advocated office pharmacy as a step toward a better knowledge of drugs and to secure definite remedies. Special attention was given green and freshly dried products. Formulas were published for the preparation of specific medicines. Finally, in order to secure the integrity of these medicines and protect them from conscienceless manufacturers, Dr. Scudder copyrighted the labels. These bore the title "Specific Medicines" and gave the specific indications for their use. The manufacture of medicines bearing these labels was entrusted to competent pharmacists and from that time the school has been free from objectionable pharmacy. Dr. Scudder advocated the use of specific medicines in the study of the relationship of medicine to disease expressions. The Eclectic of the formative period selected from other schools, but endeavored to improve. He substituted milder for harsher methods; he opposed the use of the lancet and blister, and the abuse of mercury and antimony salts. The modern American Eclectic advocates the use of kindly curative remedies, and the avoidance of depressing or depletive medication. He has been the pioneer in the study of the indigenous materia medica, with special reference to specific indications and specific uses of medicines employed. He contends for the best possible pharmacy so that the minimum amount of medicine may accomplish maximum results. Harmful medication as exemplified in excessive drugging he has consistently opposed, heroic over-drugging having been one of the most potent causes leading to the necessity for the establishment of an Eclectic school. He advocates liberality of thought, the highest medical education, the cultivation of professional dignity, and the ethics that govern gentlemen.

The position of the Eclectic school of medicine is now well established, and the attitude of malice and persecution formerly shown it by rival schools is fast becoming a memory. The school numbers upwards of 8,000 Eclectic physicians. For a period of about 10 years this numerical relation has remained nearly stationary, but because of better facilities for teaching, enlarged literature, and harmony in the ranks of the school it has never occupied so favorable a position nor had a better outlook for the future than it has to-day. Never before in its history has it been so free from internecine bickerings, attacks by rival schools, and unpleasant entangle-

ments and alliances. It challenges all ages in the wealth and completeness of its materia medica. Recognizing the merit of the work accomplished the regular profession in many localities now invites Eclectics to join its associations providing they drop their distinctive title. This the Eclectic is unwilling to do, believing that the school has earned the right to be regarded and recognized as a distinct sect in medicine. Its work in the special fields of materia medica and specific diagnosis and specific medication entitle it to this right. The Eclectic school has a strong national organization and numerous State and local societies. A national reform association was founded in 1829, and a second at Worthington, Ohio, in 1836. In 1848 the first National Eclectic Medical Association was organized in Cincinnati, Ohio, with Dr. T. V. Morrow as president, and it held annual sessions until 1858. The present National Eclectic Medical Association was organized at Chicago, Ill., in 1870, with Dr. John W. Johnson, of Connecticut, as president. It holds annual sessions, meeting in various cities throughout the United States. Eclectic practitioners now hold positions as examiners in the more important life insurance companies, and are not now debarred from the army and navy medical service as in the earlier days of medical ostracism. No discrimination is now made against them as surgeons for the great railway systems. These recognitions have been earned in the face of vigorous medical opposition, by the consistent and honorable course pursued by the Eclectic school as a whole. The Eclectic Medical College of Cincinnati, Ohio, the parent school of medical Eclecticism, chartered in 1845 as the Eclectic Medical Institute, is the leading college of this American system of medicine.

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MEDICINE, History of. Within the past three centuries the average working life of English-speaking men has doubled. A few lived as long as now, and some strong or favored ones had efficient working powers as long; but the common life was worn out in what is now middle age. In Shakespeare's time the 50's were venerable: «Old John of Gaunt, time-honored Lancaster,» was 58 when supposably so addressed; and Admiral Coligny, murdered at 53, is described by his contemporary biographer as a very old man. Now, when we hear of a death in the 60's we instinctively feel it an untimely cutting off in what should be still fresh and vigorous age, and even at 80 it seems but just fair ripeness for the sickle. The three factors which have wrought this change are advanced physical comfort, medicine and its handmaid hygiene, and surgery. And in the mitigation of the frightful mass of actual pain, of physical torment which has racked every age down to the present, and which has scarcely even been alleviated till the past century, medicine stands incomparably first.

Some good foundations had been laid, it is true, in the century previous, and men were at work in the true scientific spirit. Great masters had stimulated their successors to study in the essential preliminary subjects, the constitution and functions of the body. The mighty Boerhaave of Holland (1668–1738) had revolutionized clinical observation; Morgagni of Italy (1682–1771) had «introduced anatomical thinking into medicine» (Virchow), and had done something the same service for pathology which Haller of Germany (1708–77) did a generation later for physiology; while John Hunter (1728–93) had not only introduced capital improvements into operative surgery, but had set the pace in research into anatomical and physiological problems. But the influence of old theories, founded on guesses and imperfectly interpreted observation, still lay heavy on the body of practitioners. The chief general theories in the 18th century were those of William Cullen (1710–90) and his pupil and assistant, John Brown (1736–88), of the University of Edinburgh; the former — a great advance on the older theory of «humors,» and on the right track — made the nervous system the seat of diseases; the latter divided all diseases into two classes,—the sthenic, resulting from over-excitation and treated by depletion, and the asthenic, resulting from under-excitation and treated by stimulation. On the Continent, Hahnemann (1755–1843), his great theory propounded at Leipzig (1796–1810) soon after took adverse ground in his «homœopathy,» — a very different thing from what later passed under the name, though the latter retained the underlying basis. Besides his «law of similars,» which Hippocrates had formulated before him, he rejected theory utterly, declaring that it was impossible to know anything about pathological changes out of sight; that we can only know symptoms, and if those are removed it indicates of necessity that the disease which produced them must be gone also. He also alleged that the fact of a given dose causing certain symptoms in a healthy person was obvious proof that it must be too large for a sick one; further, that to possess healing power the dose must be too small for recognition by the senses or chemical analysis; and that trituration, or dilution and shaking, of minute doses caused molecular changes which infinitely increased their power — «dynamization,» he termed it. The exaggeration of symptomatics and empirics was a reaction against the current reliance on unbased theories; the paradox of infinitesimal doses, against the monstrous boluses and draughts with which patients were often gravely injured; there was usefulness in both reactions, but he went so far as to declare that a child could be cured while asleep by holding the pellets near it.

But the reign both of guesswork theorizing and of groping empirics, as exclusive methods, was coming to an end, and the first great blow was delivered in the first year of the century. France now came to the front where other countries had thronged. Bichat, a genius who wore himself out at 31, as did Clifford at 34, published the year before his death (1801) a work on general anatomy, in which he remade the entire science by showing that the different organs have membranes and tissues in common, and therefore that the seat of disease was in the constituent tissues and not in the organs as such. This not only simplified anatomy and physiology in much the same way that the alphabet simplified hieroglyphics, but threw the investigation of pathological changes into an entirely new channel. Parallel with this work, the followers in the footsteps of Morgagni were carrying on his work in studying morbid anat-

omy, the appearances of diseased organs; this, too, was remodeled on Bichat's discoveries. In 1808 and 1816 Broussais of Paris (1772–1838) published valuable works whose theory is merely the sthenic and asthenic idea of Brown, but which led to renewed research in pathological anatomy and local ailments. Percussion had been devised by Auenbrugger of Vienna (1772–1809) in 1761, and Corvisart of Paris (1755–1821) revived it; but a greater effect was created by the introduction of auscultation 1816–19 by the Breton Laennec (1781–1826) at Paris, where he was Corvisart's pupil. He invented the stethoscope to diagnose diseases of the lungs, heart and abdominal organs, by means of alteration in the normal sounds of their action; and his own use of it, and observations on the diseases of these organs, were the greatest advance made in clinics since Boerhaave, and may be said to have founded modern clinical science. In 1827, Richard Bright at London (1789–1858) first published his recognition of the true nature of the kidney disease since called by his name, and of the general characteristics of renal complaints, the foundation of our knowledge of them.

A special branch of investigation and analysis in the first half of the century was in discriminating the continued fevers; one of the most active and anxious battle-grounds for practitioners and theorists since modern medicine took its rise; though eruptive and malarial fevers were well differentiated. The first to be discriminated was typhoid, by Louis of Paris (1787–1872). His American pupils, W. W. Gerhard (1809–72) and Alfred Stillé (1803), with C. W. Pennock (1799–1867), all of Philadelphia, and George B. Shattuck of Boston, proved that typhoid and typhus, theretofore loosely classed together, were independent diseases, though generated by similar causes. This was confirmed by the work of A. P. Stewart at Glasgow and Sir William Jenner at London. Dengue or break-bone fever, yellow and relapsing fevers, and their kind, were carefully studied. Among the other names associated with this labor are R. J. Graves (1797–1853) and William Stokes (1804–78) of Dublin, George Budd (1808–82) of London, and Daniel Drake (1785–1852), S. H. Dickson (1798–1872) and Austin Flint (1812–86) in America. This work was soundly based by 1860 in regard to fever clinics.

Development in the United States.— When the 19th century opened there were only three medical schools in the United States, and only two of importance,— those connected with Harvard College and the University of Pennsylvania,— and only two general hospitals. Medical education was somewhat on a footing with divinity education: physicians took apprentices for some years and clergymen took private pupils in divinity. Those who wished and could afford a more systematic medical education went to London or Edinburgh. The literature of the profession was English and (translated) French almost wholly; Rush and a few others had published books, but not of moment, and there were only two or three medical journals. There were but two medical libraries except in private hands, those at the New York and the Pennsylvania hospitals. The physicians of most reputation were Benjamin Rush and Philip S. Physick of Philadelphia, David Hosack and Samuel L. Mitchill of New York, and James Jackson and John C. Warren of Boston. The smaller places did not lack for able men, though of less widespread repute: such as Daniel Drake of Cincinnati, and Nathan Smith, founder of the medical schools both of Dartmouth and of Yale. But the great repute of the French medical investigators in the first quarter of the century — Bichat, Corvisart, Laennec, Louis, etc.— took an increasing number of American students there, and the new spirit they brought back revolutionized American practice for a time. The enormous increase in American population, however, enlarged the demand upon its stock of medical knowledge far faster than that could be legitimately developed: educated physicians could not be turned out so fast as the thronging populace needed them, and it was the golden age of the half-educated. Perhaps, too, the masses had the same ideas of the needlessness of training in medicine as in public life. The machinery was multiplied indefinitely, and the product turned out depreciated in proportion. Up to about 1870 the medical schools sprung up everywhere, both public and private, and their competition for pupils degraded the standard very low indeed. Diplomas were given for two years' work, and short sessions at that; and the instructors were sometimes as incapable of giving competent education as the authorities were unwilling to enforce severe study or careful experiment. The first place to exact a new and much higher standard was Harvard, about 1870. The rapidity with which the rest of the country, in the better institutions, followed its lead, showed that there was a large instructed upper class which appreciated the need of thorough education in this as in other departments of knowledge, and understood that medicine was a great science as well as a delicate craft. As always, the rich were glad to give when they knew where to give intelligently, and endowed generously both study laboratories and general and special hospitals. It would be a grateful task to enumerate these, did space permit; here can be mentioned only such names as Pierpont Morgan and Andrew Carnegie, Johns Hopkins and Vanderbilt, Sims, Strathcona, Mount-Stephen, Payne and Lane.

Methods of Investigation.— The last century of course did not invent experiment in medicine or psychology: the method was recognized by the great Greek and Latin physicians, used by the two great Bacons, Roger and Francis, fully developed by Harvey, and utilized with superb skill by Hunter. But though these great men did not lack sound ideas, they lacked tools and the mass of laboratory facilities gradually built up in our age. The research laboratory is the development of the 19th century, and well along toward the middle of it. The workers in it experiment along three main lines,— the condition and functions of the organs in a state of health; the nature of the functional changes produced by disease, and the causes of the changes; and the prophylactic or curative agencies which can neutralize the disturbing agents. The results of these studies have created a new knowledge, which is to that of even 1800 like the relation of an adult to a baby. The physiological and pathological revelations have not merely left the knowledge accumulated in the previous centuries possessed of a merely archæological interest, but they have weaned us from

the sway of any authority whatever; recognizing that even the seemingly soundest conclusions of the present are but working hypotheses, which may have to be abandoned at any time on fresh evidence,— the true scientific spirit. No part of life has been left as it was, the digestive and assimilative, circulatory, respiratory and excretory, reproductive and directive functions have all been illuminated by a flood of light. Especially has this been wonderful in the study of the brain, whose functions not only are so intangible and elusive, but apparently so impossible of experimentation without destroying the subject of experiment. Not only have we penetrated deep into the secrets of the paths and operations of sensory and motor impulses, the localizations of functions and the mechanical implements of thought and memory, but we have been enabled to apply with great success a number of curative measures not before dreamed of, or even if so, not deemed possible of use.

Another marked feature of the age is the development of specialism, in which we have to set off a lack of co-ordination and breadth of knowledge or judgment against an extension of knowledge not possible by any other method. Scientifically, no other means has been so potent in extending and deepening the realm of demonstrated fact. Practically, no other has been so effective in developing curative processes. This specialism must not be confounded with that of the "lung doctors" and "fever doctors" of former days, mere guesswork empiricism of uneducated practitioners; it rests on a basis of competent general medical knowledge and thorough education in the specialty besides. The physicians who give their time and thought to one limited field — diseases of women, of children, of eyes and ears, of throat, of teeth, of the brain, or who, though less exclusively, choose diseases of the heart or the liver or other organs for their preferred field — have won for the profession some of its most signal triumphs. American physicians especially have stood at the very head of those who have perfected dentistry and ophthalmology, as well as gynæcology or diseases of women. In this branch the blessings they have conferred not only on women in ordinary disease, but on both them, their male relatives, and their children, by the saving of life and health, in the special crises of the sex, cannot be estimated.

One of the finest branches of this specializing is that of alienism: and the change in the mental attitude of the public toward it in consequence of that study has been most remarkable and gratifying. From a matter of derision, as it was largely in the Middle Ages, or ineffectual commiseration as an act of God, or mere terror and aversion, it has come to be sympathetically studied, often relieved, and always recognized as a mere functional disease. Starting from the labors of our own Rush, of the English Tuke, of the German Jacobi and Hasse, and the French Pinel and Esquirol, this reform has built up a body of physicians in every civilized country not only to study mental aberration scientifically, but to introduce humane and rational methods into its care and cure. America is not behind any other in the treatment of the insane; but the curse of so many good causes in America — politics — is a blight upon this science still in too many States.

Prophylactics.— "Prevention is better than cure" has reached its most brilliant exemplification in the 19th century. It is true that nations far back in antiquity have grasped some of the chief conditions under which diseases most prevail, and have even carried systems of public hygiene much farther than even yet we have re-attained to. The law of Moses furnishes a remarkable example, in its insistence on cleanliness, isolation and diet; the Greeks systematized diet and exercise and general physical training thoroughly, their ideal being "the fair mind in the fair body" (and had discovered that professional athletes do not make good soldiers, from lack of endurance); the Romans and Greeks made the bath almost a fetish, far beyond even the English, and the public benefactor of the day gave his city baths, not libraries. But modern science goes much farther: it discerns the causes which create the disease itself, and removes or neutralizes them. In the 18th century some light had been thrown on this: Howard had seen that typhus was in direct ratio to the crowded condition of jails. Captain Cook and Sir Gilbert Blaine had perceived and removed the conditions that generate scurvy. Jenner had gone still farther and anticipated the methods of modern preventive medicine by vaccination. But all these could only be feeble and groping attempts until there was a scientific basis for them. This was furnished by bacteriology, and a few words upon that are needed to make later explanations intelligible.

The Bacteriological Basis of Preventive Medicine.—The ancients speculated with great eagerness and sometimes acuteness on the origin of life, and had guessed that disease and living germs were in some way related; and the relation of disease and putrefaction was not doubted. As soon as the first weak crude microscope was invented, it was used to investigate the organisms of decay. The Jesuit Kircher in 1671 examined the "minute worms" in putrid milk and cheese and meat; in 1675 a Dutch merchant named Leeuwenhoek improved his lenses and studied the "animalcula" in rainwater, saliva, intestinal fluids and putrid substances; and the physicians of his day were quick to suspect and suggest that these organisms might be the cause of all diseases. In 1762 the Viennese Pleincz, who had studied fluids in all conditions, gave his firm adhesion to this belief. But this was not the whole; whence came these organisms — were they self-generated, or simply transmitted from other bodies and multiplied? Despite even the microscope, the theory of spontaneous generation maintained itself tenaciously far past the middle of the century. A distinguished chemist maintained as the result of careful experiment that germs were so generated, and even the proof that the organisms were forms already existent did not convince him or his followers. It was reserved for Pasteur in 1861, and finally (with Koch and Cohn) in 1876, to crush this theory forever. Following quickly on the first came the discovery of the anthrax germ by Pollender and Davaine in 1863; shortly afterward Lister's epoch-making researches into wound infection, making possible the triumphs of antiseptic surgery; then swifly followed the isolation of the germs of relapsing fever, leprosy, and typhoid. But towering above all, from the

enormous difficulties overcome, were Robert Koch's isolations of the tuberculosis germ in 1882, and of that of Asiatic cholera in 1884. Thence on, a crowd of discoveries of the germs of other diseases have left but few — unfortunately, some of the worst — unrevealed, diseases of animals and insects having been investigated as well as those of men.

Thus much for the history of discovery; but what are these germs? The popular mind is very confused on the subject. Bacteria are generally thought of as a sort of worm. In fact, they are not members of the animal but the vegetable kingdom; the smallest organisms known. They are protoplasm, a jelly-like substance, enclosed in a hard membrane exactly like wood fibre. They are classified by shape in three groups: cocci (spherical), bacilli (rod-like), and spirilla (corkscrew or undulatory shape). The cocci are found in pairs, fours, clusters, or chains; they include the smallest known organisms, some of them being as small as 1/150,000 of an inch in diameter. The bacilli are larger but vary much, from 1/25,000 to 1/4,000 of an inch in length, and 1/125,000 to 1/16,000 in diameter; some of them have organs of locomotion, called *flagella*. The spirilla are longest of all, sometimes 1/600 of an inch. They all increase either by fission into two, or by developing a spore or seed. Their rate of multiplication does not seem rapid, but that is because we forget our old arithmetical «catches.» A bacterium dividing each hour, and each division thus dividing, would obviously have increased to 8,388,608 in 24 hours; and in three days to a number beyond all verbal expression, weighing nearly 7,500 tons. Of course this is a *reductio ad absurdum*, as the body they feed on would be exhausted early in the series; but outside of starvation, nature has other ways of arresting their multiplication.

Before discussing this point, let us look at the nature of bacteria as a whole. It is a misapprehension to think of them simply as a principle of disease and death. They are a universal principle of life as well, and the few species which cause harm are lost in the myriads which do good. But for them, organic existence would perish; it has been suggested that the first organic things on earth were bacteria,— organisms needing only nitrogen for support, — and life means their multiplication. They abound in air and water, in the soil to nine feet deep or so, and in the outsides and insides of all organisms; but naturally their number varies with the conditions for sustaining existence, and there are none at extreme altitudes or in glacier ice, and few in the polar regions or the deep seas. Those conditions are (1) moisture, without which all die; (2) air, as to which there are three classes,— aerobes which must have it, anaerobes which must not have it, and facultative anaerobes which care nothing either way; (3) food, which must be living tissues for a few, may be dead ones for most, and can be mineral salts or atmospheric nitrogen for some: (4) temperature, which has for possibilities of their multiplication, though not of their life, extremes of 32 and 170° F.; for an average most favorable tract 60 to 104°; and for disease germs (as evolution would imply) 98.4°, or blood heat is most favorable; (5) light, of which direct sunlight is death to all, and common daylight, of no importance either way to most.

Their enormous number gives them a power of accomplishment seemingly almost miraculous and certainly far superhuman. The quality of farm products and dairy products, of fatted stock or wool, of hides or horn, and many other familiar articles, is due to them; and they are the scavengers of our water supply from pollution, as well as some of them deriving powers for harm from it. Still more to our surprise, peas and beans certainly, and all plants probably, gain their life from the soil through the medium of bacteria which live in their roots, decompose nitrogenous minerals and feed on atmospheric nitrogen also, turning both kinds over to the plant for its nourishment.

Hence the processes of health and disease alike are functions of bacteria. What medical science has specially to do is to trace the progress and manifestations of that spread of harmful bacteria commonly called «infection,» and the methods by which the system's natural tendency to starve or poison them can be reinforced. Before entering upon the phases of prevention and cure, we must indicate briefly how they obtain entrance, how they produce their effects, and what is the reaction of the body thereupon.

The first is naturally limited in variety: they enter by being injected from the bites of animals or insects, from wounds or abrasions, from inhaling infected air, from eating or drinking substances containing them. Specific cases will be considered later. The action of the microbes is by generating a set of poisons known as toxins, which produce either languor, loss of appetite and vague general discomfort, or more active pains, headaches, fever, inflammations of the tissues, perhaps entire stupor. The action of the body is complex and difficult, and not thoroughly worked out; but some things are known. The normal blood and tissues have a germicidal power, varying in different bodies even of full health, and varying still more as to specific germs, each body having its own set of germs to which it is congenial or maleficent. The struggle of the body against their multiplication, dependent on this unfavorableness of soil for their propagation, is called «general resistance,» and on its strength depends the immunity against ordinary disease; and the secret of inoculation is, that if the soil favorable to the propagation of a specific bacterium is eaten up, it is usually very slow in fresh growth. The disease microbe gains no lodgment because there is nothing to live on. But in addition to this passive resistance, an active one is carried on by the white cells or «leucocytes,»— the wandering cells, and those of the tissues chiefly invaded, as well as those of the spleen and lymphatic glands; these and others seem to work among the toxins and produce a change in their chemical constitution, at last elaborating counter-poison or *antitoxins* which neutralize the first, and enable the cells to carry on the war against the disease microbes till one or other is overcome; and as said, if there is recovery, a partial or complete immunity is afforded against further ravages of the same class of microbe.

But it is evident that if this process can be shortened and made more certain, so that the antitoxins can perform their work before the

disease microbes arrive at all, a great system of prophylactic or preventive medication can be had; and if the antitoxins are used in a case of similar disease, they will strengthen the natural power of the body to develop them, and greatly aid it in throwing off the disease. This is the new system of serum-therapy, begun by Pasteur in 1877, and continued by a set of brilliant experimenters since. The serum of the infected blood is chosen as a medium for injection into the blood of the patient. Pasteur with fowl cholera, Raynaud with cowpox, Salmon and Smith in this country in 1886 with hog cholera, fully proved the possibility of the treatment, curing animals previously inoculated with the most virulent disease poisons, and rendering healthy animals immune; but these excited but languid interest till Behring's announcement in 1892 of a diphtheria antitoxin, with incontestable proof of its value. Oddly, not only laymen but physicians in many cases opposed it; partly from misunderstanding, partly from humanitarianism as involving experiments on animals. Most of its opponents have now been won over, from the crushing weight of evidence, and the brilliant work of its supporters. Diphtheria alone has reduced its mortality one-half since the introduction of the serum treatment little more than a decade ago.

To illustrate the general methods of preparing all the serums for infectious diseases, that of diphtheria will serve as a model. The bacilli are cultivated for 8 or 10 days in alkaline beef broth, found to develop a peculiarly virulent poison under its work; the toxin is then isolated and its strength precisely estimated, then set aside in sterilized vessels. A healthy horse, found by experiment the most suitable animal, has injected under the skin of its neck or forequarters 20 cubic centimeters of toxin and perhaps half that of antitoxin, three times five days apart; then it is given heavier and heavier doses of toxin alone, a week apart, till it can endure doses speedily fatal at the outset. After two months it is bled and its serum tested; if satisfactory, it is dosed as before for another month, when the maximum quality of serum is usually reached. The animal is then bled sufficiently, the blood being caught in a sterilized vessel and placed in a refrigerator. The coagulation finished, the serum is drawn off from the clot and its strength accurately determined in the laboratory, an antiseptic is added to keep it, and it is bottled for use. Antitoxins for tetanus and snake bite have been similarly prepared, and the present century will see probably every infectious disease and every venom with its bacterial antidote.

Specific Results of Preventive Treatment. —An abstract of the work already done in preventive medicine can best be given by a note of the great maladies of men and animals more or less controlled by it, with their bacteria. But it must be noted that of the ones cited, the bacteria of smallpox and hydrophobia (though the former has been almost exterminated by vaccination), as well as scarlet fever and measles, have not yet been isolated. The reason may be excessively small size, since that of cattle pleuro-pneumonia is barely visible under the microscope; or it may be that the organisms are not bacteria but unknown beings.

The diseases may be classified variously, and some admit no special classification, but we will begin with the great scourges which have desolated the world in the past, and which have owed their virulence and destructiveness, though not their direct origin, to filth and overcrowding and general unsanitary conditions.

(1) The Great Plague, or Bubonic Plague. The frightful devastations of this in the past need not be recited; it will be remembered that it was the "Black Death," which swept off from a third to a half the population of Europe in the latter part of the 13th century. Long thought almost extinct, it reappeared with fearful intensity at Hongkong in 1894, spread to India, and had several occasions of violent outbreak, raged in Turkey and on some parts of the Mediterranean coast, and in small volume has shown itself in Glasgow, South American ports, New York and San Francisco. But in western Europe and America it has been easily put down, and serum inoculation has been fairly successful in India. Its bacillus is known to enter the body by wounds of the skin, and very largely by bites of fleas from infected rats.

(2) Asiatic Cholera. This terrible plague even in the middle of the 19th century swept away thousands of lives in America; now it has been so thoroughly controlled that it is not feared even to the extent of disturbing commerce when it appears. It originated on the banks of the Ganges in India, where Koch found its spirillum and the means of its spread, —almost entirely through drinking infected water, though very slightly by contact,— so little that since 1873 the disease in Great Britain and the United States has never got farther than the port of entry. How thoroughly a city's immunity depends on its water supply is strikingly shown by the twin city on the Elbe in 1892; Hamburg, using the unfiltered river water, had about 18,000 cases and 8,000 deaths: Altona, with a filtration plant, had 516 cases, largely refugees from Hamburg.

(3) Typhus Fever. It is hard to believe that this was once so steady and frightful a curse in the West that one investigator says its history would be that of Europe. In all the large cities, in camps and ships, hospitals and jails, it was almost permanent and its rate of mortality appalling. It depended so entirely on filth and overcrowding that mere city sanitation and cessation of packing, sewers and a good water supply, have practically exterminated it except in a few slums. The rate has been reduced in England from 1,228 per 1,000,000 in 1838 (typhus and typhoid together, not then discriminated) to 137 typhoid and 3 typhus at the present time. In 1915 announcement was made that the bacterial origin of typhus fever had been established.

(4) Typhoid Fever. This disease, long identified with typhus, is now not only known to be separate, but dependent on somewhat different generating conditions. It depends not so much on dirt and crowding as on sewer gases and contaminated water and milk. Given pure water and perfect drainage, a city practically has no typhoid,— except when its milk supply is drawn from infected sources, as often happens; while seaside resorts are notorious generators of the disease, from the sand-driven wells and the crowded privies draining into them. The germ was discovered by Eberth in 1880,

and called *bacillus typhosus*. The continued prevalence of the disease in our cities is due partly to the great hardiness of the bacillus, which can exist in the body of a patient long after recovery and be a means of contamination. The outbreak in the Spanish-American War seemed due to over-crowding, but more likely to the contaminations caused by it, as in the seaside cases. In the country districts there is no mystery about it: often there is no rural sanitation and even the wells are grossly neglected, sometimes on a slope below a barn. In the typical example at Plymouth, Pa. (about 8,000 people), the evacuations of a typhoid patient were thrown out during the winter on the banks of a stream which fed the town reservoir; the spring thaw carried them into it and the town had a typhoid epidemic which struck down 1,200 people. The people precautions are the use of boiled water and of distilled-water ice, the thorough inspection of dairy surroundings and water sources and great care on the part of physicians and nurses to disinfect discharges, are the true prophylactics.

(5) Diphtheria. This bacillus was discovered in 1883–84 by Klebs and Loeffler, and has been given their joint names; it enters either by inhalation or the stomach. The antitoxins thus made possible of preparation have reduced the mortality one-half; the hygienic precautions have greatly reduced the primary prevalence. The latter are isolation and disinfection, watchfulness during convalescence, careful examination of the least throat disorder and — since the mild and often unsuspected cases where the children go about and to school freely are the worst in spreading the disease, because not guarded against — regular inspection of school children's throats. Children's teeth and mouths should also be carefully attended to and the tonsils removed where tonsilitis is frequent.

(6) Yellow Fever. The germ of this has not yet been isolated. Its dependence on dirt, however, would seem almost as close as typhus, thorough sanitation having practically eradicated it in its favorite tropic home, Havana, and in the Southern cities once ravaged by it. Jamaica has been almost freed from it in the same way.

(7) Smallpox. This once widespread and sometimes destructive scourge, almost more dreaded for life than for death, has been so nearly eradicated by vaccination, and vaccination alone, that the persistence of a strong section of the community opposed to it is one of the strangest of phenomena. The evidence is overwhelming. Wherever smallpox breaks out, it is in an unvaccinated district, country or body of people, and the fatalities are almost all among the unvaccinated and never among the re-vaccinated; where two bodies of men lie side by side under the same conditions, as the French and German armies in 1871, the vaccinated body scarcely suffers, the unvaccinated one is decimated; and in Egypt, where the natives are compulsorily vaccinated and the foreigners escape it, the fatalities are five foreigners to three natives, though the latter are far poorer, worse housed and fed and medically cared for, and would naturally be supposed the chief victims. If all the people of a country were vaccinated and re-vaccinated at fair intervals, the disease would absolutely disappear, as it has in the German army: it is the ones who escape vaccination that maintain its existence. The ravages still among the unvaccinated French Canadians are a constant example of what it has been. For instance, on 1 April 1885 there was a smallpox death in the Montreal hospital the Hôtel Dieu; the patients who had not had it were sent home; the disease spread like wildfire, and by the end of the year 3,164 persons died of it, the city's business for the winter was destroyed, and the loss was millions. It has been proved that not above one in 100 of the vaccinated takes the disease when exposed and almost none die; of the unvaccinated, fully 99 per cent take it and 25 to 30 die. It must be remembered, however, that there cannot be perfect security without frequent re-vaccination, as the power of the cowpox varies with different persons and is rarely permanent, sometimes not over a year or two. With animal lymph there is no danger of the introduction of other diseases, the fear of which is made an excuse for refusal.

(8) Tuberculosis (including "consumption" of the lungs), called by Holmes the "white plague"; the most destructive single agency of death, and responsible for 120,000 deaths a year in the United States, more than all other infectious diseases together, except pneumonia. Formerly believed hereditary (the truth in a very slight degree), it is now known to be the product of a bacillus, isolated by Koch in 1880–82; and the hereditary conditions are mainly environment, with some tendency to anæmia. The communication, though in a few cases by infected milk, in the overwhelming mass proceeds by inhalation of the particles of dried sputum from other consumptives' lungs, blown about in the dust of streets or houses, or even wards of hospitals. Naturally, the greatest mortality is in places where free circulation of air is not possible, as jails and "institutions." Nature seems to have provided for the largest possible distribution of them: one patient not in extremes has been known to give off from two to four thousand millions of germs in 24 hours; they are shaken from handkerchiefs, from the beard or mustache, from the furniture and other things handled by consumptives, beaten up from contaminated floors. So universally diffused are they that it seems probable there are few persons who have not some tuberculous lesion of some organ, for it is not confined to the lungs. The great weapons against it are, first, maintaining the standard of nutrition and cleanliness as high as possible; with careful protection of the chest; second, the education of the public in the dangers of the dried sputa; third, enforcement of notification and registration of cases; fourth, public sanatoriums for treatment of early cases; fifth, special hospitals for incurables. Immense progress has already been made: the rate in Massachusetts, one of the chief seats of the disease, has fallen from 42 to under 21 per 1,000 since 1853; and in New York, Glasgow and other great cities the drop has been similar.

(9) Pneumonia. Frankel in 1886 isolated this germ, a coccus growing in pairs and chains and entering by inhalation; and with one-fifth of healthy persons, present in the saliva. This is almost the one disease which has not diminished under medical and hygienic science, and has apparently increased, ranking

next to consumption in deadliness. It is especially a disease of languid circulation, as in the aged (their typical disease) and invalid and the intemperate; but it lays low vast numbers of the strong as well. The treatment has been revolutionized from the bottom, but still from one-fifth to one-fourth of all attacks are fatal. Thus far the most valuable novelties have been measures to prevent sudden heart failure.

(10) Malaria. Till a generation ago, this was one of the obscurest diseases on our list; it still remains one of the worst drawbacks to civilization, preventing general Caucasian settlement in the tropics. It was known to have an intimate connection with wet ground, marshes or the building up and sewering of new districts; to prevail chiefly in the fall, and be caught chiefly from dusk to dawn; and to be noncontagious. But nothing more was known till M. Charles Laveran, a French surgeon who had gone to Algeria specially to study the disease, discovered the germs in the red blood-corpuscles of patients; not bacteria, but small protoplasmic bodies which begin as transparent rings inside the corpuscle, feed and enlarge on its coloring matter and form blackish grains from it, and on attaining a certain size divide and redivide in vast multitude, giving off a toxin which causes the acute spasm of fever, and apparently of chill also. Each variety of the fever is caused by a special form of the parasite. It was suggested by Dr. Patrick Manson of London that the communicating agent might be mosquitoes, also products of wet ground and active after dusk; and an army surgeon of India, Ross, found that mosquitoes did transmit similar parasites between birds,— developing them in their stomach cells into filary bodies, which pass into the saliva and so through bites into the bodies of others. It is now thoroughly established that this is the chief means of transmission among human beings. The mosquito is not the common *culex* of the northern United States, but chiefly the *anopheles*, which develops and transfers the parasites as just described. The crucial experiments are, that these mosquitoes, allowed to bite malarial patients and subsequently healthy persons in nonmalarious regions, infect the latter, and that in the deadly *campagna* around Rome, two persons during the worst season, from 1 June to 1 Sept. 1900, lived entirely immune by simply keeping behind tight netting after dusk, while exposing themselves freely during the daytime. The net result is that swamps and stagnant pools should be drained, that persons having malaria should be thoroughly treated with quinine so that they may not transmit the disease if bitten by mosquitoes, and that Europeans can live in the worst districts by not being out after dusk and by thoroughly wiring their houses.

(11) Venereal Diseases. These are in one respect by far the worst of all we have to mention; for they are the only ones transmitted in full virulence to innocent children, to fill their lives with suffering and which involve equally innocent wives in the misery and shame. In the victim the infection does not stop with the parts originally affected; and it has not been seriously checked, from the nature of its causes making it impossible for society to stamp out or much diminish the actions which involve it. Physicians and the public have each solemn duties in this matter: the former to act as apostles of continence, especially with the bachelors who pretend to believe that their health needs the indulgence and will not marry, and to use every effort to prevent the disease being carried to others; the latter to let no scruples of delicacy or affected ignorance stand in the way of thorough public supervision. The opposition to this is natural: women feel it adding an unfair stigma to an already shameful load of injustice; decent people feel that legal recognition is legal palliation and defense, and there is the real danger shown by experience, that if it is once shielded by the law the weight of the police force will be thrown on the side of protecting instead of abating houses of ill-fame, as with liquor saloons, but with far more disastrous results. But any risk is preferable to the present shocking conditions, which make city brothels a stream of contamination to what should be the purest of homes.

(12) Puerperal Fever. Remembering not merely the former fatality of this disease — terribly frequent in private practise, and in maternity institutions rising from 5 even to 10 per cent — but the double bereavement it usually involves, the almost entire extermination of this disease is one of the grandest triumphs of modern medicine. Its contagiousness had long been suspected, when Oliver Wendell Holmes in 1843 published a full and clear statement of the facts leading to the belief; but for many years the profession generally scouted it — a wit and poet could be no authority in medical science. Others gradually took his view, but it was the Lister antiseptic treatment which enabled it to be fully tested. Now the mortality is but about one-third of one per cent.

(13) Hydrophobia. This disease, though widely distributed among animals, is not very common among human beings in America, but excites a widespread horror from the multitude of pets, any one of which may chance to be stricken and to communicate it; in Europe it is less rare. The germ has not been isolated, but Pasteur ascertained its calculable effects on the nervous system, and that certain inoculations could render healthy animals immune and neutralize a powerful dose of the virus. He founded an institution in Paris for its treatment, and the mortality among those bitten by certainly rabid animals was reduced to less than one-half of one per cent. In dogs, quarantine and muzzling are the only precautions.

(14) Leprosy. This is caused by a bacillus which probably enters the body through abrasions of the skin, and probably only from contact with another person; even so, it is but slightly contagious, contrary to the popular notion. It was discovered by Hansen in 1879, and since then an active and very hopeful investigation into prophylactic conditions has been carried on. Known to be old and widespread in Asia, it is not generally known that it came into San Francisco with the Chinese, that the Norwegians have given it a considerable foothold in the Northwest and that in Louisiana there is an endemic condition of it, and slightly in some other southern States. It exists in New Brunswick likewise. Still more important for the United States is its great

abundance in Hawaii and the Philippines. It can be readily kept in check by segregation and inspection.

Some other bacilli may be mentioned, of which the discovery has not as yet been followed by large results in prevention. The deadliest known is that of lockjaw or tetanus, discovered by Nicolaier in 1884; it enters by wounds, and in some tropic parts all lesions tend to develop tetanus as surely as other sections do gangrene. Influenza, or "the grip," has one of the smallest bacilli known; it is spread by dried nasal discharges and enters by the nasal tracts. Anthrax is a disease mainly of cattle and sheep. Its bacilli were the first micro-organisms of disease to be isolated and can enter either by inhalation, infected food or abrasions.

Changes in Therapeutic Method.— It is only restating the same fact to say that new practice has followed on new theory, or rather new scientific knowledge of the nature of diseases. The only object of acquiring the knowledge was to embody it in practice. With the discovery of the zymotic principle in disease, traced finally to bacterial action, there could not be the same or like treatment as when the body was supposed to be possessed by conflicting "humors"; or when a fever was supposed to be an abnormal increase of vital fluids needing to be drained off; or when diseases were supposed to have no relation to any function of the body except the organs furnishing the dominant symptoms; or when one school supposed them waves of some sort, to be overborne by more powerful waves of the same class, and another school refused to entertain any theoretical suppositions at all, but relied on the history of cases, printed or traditional or experimental. But it may be said that the greatest revolution in the century, or at any rate the last half of it, is in the position assigned to drugs. At the outset the old faith in bleeding still held great sway: Boerhaave himself had made almost the whole art of medicine consist in its proper application, and at the end of the 18th century Washington had been sacrificed to it. But by the middle of the century it began to diminish. Both the homœopathic and the regular schools based their practice, and many still base it, on the study and administration of drugs. They differed in the size and strength of doses, from huge boluses or powders or draughts whose efficacy was supposed to be in proportion to their nauseousness, to small bland triturations or dilutions; but not in the assumption that in them lay the one efficient method of dealing with disease.

The advanced school of the present does not discard medicines; so far from it, it studies them with more care than ever, and values a few, well tried and certain of quality and action, as highly as ever. It knows the mass of current medicines to be inert or worse, uncertain of action and applied to human functions of still more uncertain action; but it seeks to study thoroughly and apply scientifically the few real medicines or healing agents which must be used — quinine and digitalis and opium, iron and mercury and iodide of potassium, etc.— instead of a swarm of dubious and varying materials. It is significant that some of the stand-bys are extremely old; iodine, as ashes of burnt sponge, was known in classic times, and ergot impressed its peculiar action on stock-raisers' minds from very early ages; even Peruvian bark is nothing new. We have not as yet made as many additions to the stock of panaceas as we might. But chemistry has done vast services for us, and will probably do far more. Aside from the discovery of new substances like cocaine, it has given us the active principles, of calculable strength and purity, in place of crude drugs of varying strength at best, and of varying purity and age, and there is no reason why we may not have new specifics as sure (and for as important diseases) as quinine.

But the new school does not feel itself under obligation to give any medicines whatever, while a generation ago not only could few physicians have held their practice unless they did, but few would have thought it safe or scientific. Of course there are still many cases where the patient or the patient's friends must be humored by administering medicine or alleged medicine where it is not really needed and indeed often where the buoyancy of mind which is the real curative agent can only be created by making him wait hopefully for the expected action of medicine, and some physicians still cannot unlearn their old training. But the change is great. The modern treatment of disease relies very greatly on the old so-called "natural" methods, diet and exercise, bathing and massage — in other words, giving the natural forces the fullest scope by easy and thorough nutrition, increased flow of blood and removal of obstructions to the excretory systems or the circulation in the tissues. One notable example is typhoid fever. At the outset of the 19th century it was treated with "remedies" of the extremest violence — bleeding and blistering, vomiting and purging, and the administration of antimony and mercury and plenty of other heroic remedies. Now the patient is bathed and nursed and carefully tended, but rarely given medicine. This is the result partly of the remarkable experiments of the Paris and Vienna schools into the action of drugs, which have shaken the stoutest faiths; and partly of the constant and reproachful object lesson of homœapathy. No regular physician would ever admit that the homœopathic preparations "infinitesimals," could do any good as direct curative agents, and yet it was perfectly certain that homœopaths lost no more of their patients than others. There was but one conclusion to draw — that most drugs had no effect whatever on the diseases for which they were administered.

These "natural methods" have been indicated above, but some further analysis of the individual elements is worth while. It will be noted that this is not, as a hasty reader might assume, the discarding of all the results of civilization and a return to barbarism. That the natural methods are efficient is precisely because scientific knowledge and modern improvements in appliances, as well as the thousand civilized devices for comfort and cleanliness, unattainable even a generation ago, have raised them to the level of first-rate therapeutic agents.

Perhaps foremost in the rank is the trained nurse, who is not only a greater agent of philanthropy than many professed altruists, but sets free the physician from a load of care and anxiety. In place of ignorant and stubborn

usually conceited and often superstitious women, who pride themselves on defying all the doctor's commands, these intelligent and loyal women can be relied on to carry out all his injunctions, to watch carefully for indications of danger and to furnish notes enabling him to view the progress and hourly changes of a critical case.

The importance of diet in therapy, and indeed in the preservation of health before the system becomes a subject for the physician, has never been wholly lost sight of, but at no time has it been so thoroughly recognized, so firmly insisted on, raised to so high a place in therapeutic agencies. Too much food, improper or ill-prepared food, over-haste in eating, all have their part in the dyspepsia which is a by-word among foreigners as the national malady, and though much lessened, is still most formidable. Over-eating, too, is largely responsible for the prevalent Bright's disease and degeneration of the arteries. Sweetmeats and the mixtures of the drug-stores, ice-cream soda and artificial flavors, are other potent causes; especially among girls is the eating of candies between meals. The business man's five-minute meal at the lunch counter saves his business time often to the permanent ruin of his health. The question of alcoholic drinks is usually left to the forum of morals or politics, but it has a serious bearing on health, though not nearly so much as one or two generations ago. The introduction of light beers has not only lessened drunkenness, but organic diseases of the liver, stomach, heart and arteries.

Few influences on general health have been greater or more beneficial than the enormous multiplication of the means of cheap enjoyable outdoor exercise in America within the past generation. Owing to the climate it is much harder to keep up habits of steady exercise here than in Europe, and unless there can be sociability with it, most people will not put themselves under the stress. We have not been a people addicted to sport or play, and formerly there were not sufficient means provided for us. Now tennis and golf and the bicycle and their kind are improving the constitutions, especially the nervous condition, of vast numbers. Of course there must be judgment in these matters, and probably some elderly people injure themselves by indulging in severe athletic sport only fit for young people with sounder tissues.

Massage need only be mentioned; its aim is primarily to remove obstructions to circulation. The normal blood should be sufficient to establish normal bacterial and other conditions, and massage gives it the freest play. The essence of bathing, called when practised scientifically "hydrotherapy," is the same, save that its special function is to free the obstructed perspiratory system.

To these might be added a fourth, which in some sense is the most natural of all; for it has been practised in ages more remote by many thousands of years than the suspicion of either of the others, and by savages almost at the bottom of the human scale; that is, some form of suggestion or hypnosia. The main difficulty of this sort of treatment is that so little has been done to make it utilizable in practice, or to provide any certain means of assuring a definite result. Another is, that as with all the forms of mental science, its vagueness, its mystery, the impossibility of regulating its manifestations, surround it with so hopeless an atmosphere of fraud and of that open-mouthed credulity which irresistibly invites fraud. Yet after all, the psychical method has always played an important though largely unrecognized part in therapeutics. It is from faith, which buoys up the spirits, sets the blood flowing more freely and the nerves playing their parts without disturbance, that a large part of all cures arises. Despondency or lack of faith will often sink the stoutest constitution almost to death's door; faith will enable a bread pill or a spoonful of clear water to do almost miracles of healing, when the best medicines have been given over in despair. The basis of the entire profession of medicine is faith in the doctor and his drugs and his methods. This is no new discovery: it was said by Galen that "he works the most cures in whom most have faith," and the doctor-chemist-charlatan Paracelsus, who died of taking a universal panacea too poisonous even for his confidence, told his patients to have full faith and a strong imagination and they would see the effects of it.

The subject of hypnotism, originally called mesmerism from its 18th century describer and practiser, can only be touched upon. Different practitioners have had such varying results from its use as to suggest that here too the personal equation is very important. Braid of Manchester, England, who first made a scientific study and attempt at utilizing it, was not successful; while an English surgeon in India, Esdaile, was highly successful, performing 268 operations on patients with all the effect of anæsthetics, not then introduced. Its possibilities have been greatly exaggerated, not so much by the claims of the persons using it (except impostors) as by the eager credulity of the public. It seems not so much to create a new condition of sensitiveness to suggestion as to increase what normally exists. In organic disease it is practically useless. Its great service has been found to be in various affections which may all be classed as of the nervous system: hysteria, spasmodic functional complaints, children's vicious habits, and the victims of the drug and alcohol habits; occasionally in childbirth and surgery, but it is precarious and not free from serious dangers. It should no more be practised without witnesses present than dentists give nitrous oxide, and the law should restrict its practice to special licensees or physicians of a certain grade.

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MEDICINE, Preventive. See PREVENTIVE MEDICINE.

MEDICINE, Recent Progress in. Of none of the departments of human knowledge can it be said that it is thoroughly and positively progressive more than of the science of medicine. The new birth of medicine may be said to be associated with the names of three men, Virchow, Pasteur and Lister (qq.v.), all of them men of the 19th century.

Virchow, while not the discoverer of the different cells of the body, determined that its tissues were entirely composed of cells of various kinds, and he particularly identified the different types of diseased structure of the

tissues by the form of cell which predominated in each of them. Pasteur opened to the vision of the world the vast field of the infinitely small, discovered and described many varieties of bacteria, separated them from one another, cultivated them on artificial media and demonstrated their enormous significance for good or evil. As the father of the science of bacteriology (q.v.) he was one of the greatest benefactors the world has ever had. Lister, who died in 1912, may justly be called the apostle of cleanliness. To him more than to anybody else is due the demonstration that cleanliness is really next to godliness. By avoiding dirt of all kinds, by the use of chemicals to destroy germ life and finally by the simple practice of absolute cleanliness in every department of surgery he revolutionized that art, and made possible, as matters of everyday occurrence and of comparative safety, procedures which before his time were considered extra hazardous and which in the great majority of cases resulted fatally.

The stimulus produced by investigation of Lister in the realm of antisepsis during the seventh decade of the last century was quickly responded to by surgery. The chief points in Lister's recommendations consisted in cleanliness of wounds and all their surroundings; cleanliness of the surgeon, especially of his hands and finger-nails; the use of carbolic acid, particularly in the form of spray in the operating room during an operation, to destroy the disease germs in the atmosphere, and the use of antiseptic dressings or coverings upon wounds.

The older surgeons smiled at all these details which seemed to them foolish and unnecessary. After 25 years practically all opposition had been overcome. The results compared with the results under the old system simply compelled the adoption of the new principles. But experience also showed that the use of powerful chemicals was unnecessary in the treatment of wounds, and that often it was really injurious. It was then determined that the sterilization of every thing which had any relation to a wound could be accomplished quite as effectually through heat and moisture as with chemicals and with a greater degree of comfort and safety. Consequently the instruments, the dressings and all the apparatus connected with an operation were subjected to a high temperature sufficiently long to destroy all germ life, and the surgeon himself and all his assistants put on freshly laundered white clothing, and washed and scrubbed their hands, face and arms with soap and water sufficiently long to ensure relatively complete cleanliness. Then rubber gloves were put on as an additional safeguard against the contamination of the wound which was about to be made.

This is practically the procedure which is now carried out at a surgical operation in every modern hospital throughout the world. Such precautions enable surgeons to penetrate any portion of the body with absolute fearlessness, and with the confidence that in the great majority of cases in which proper judgment has been shown in selecting the case, and proper skill possessed by the surgeon, the patient will recover. It will not bring the dead to life, but it will often restore those whose lives hang by a mere thread. Thus surgeons are able to perform operations within the skull, within the cavity of the chest, within the cavity of the abdomen, and within the joints and upon the brain, the heart and lungs, the stomach, liver, spleen, intestines, pancreas, ovaries and uterus and the kidneys, ureters and bladder, which were impossible before the time of Lister, or if they were performed the patients almost invariably died.

One of the most recent developments in surgery consists in the transfer of blood from the arm of a healthy person directly into the circulation of one who is almost at death's door either from loss of blood, from the shock of a surgical operation or from some other cause. An attachment is made between an artery in the arm of the healthy person and a vein in the arm of the sick person by means of a suitable tube which is carefully adjusted into openings made in the vessels above mentioned of the two persons, the outflow being so gauged that it will be known when the proper quantity has been withdrawn. The method has proved life-saving in a number of instances, but it is not without danger, for should a clot or clots form in the outflowing blood it would quickly check the circulation in the receiving person or might quickly cause death by interference with the heart action.

Another important procedure which has been perfected during the past 25 years is what is known as the Cæsarean section, which consists in removing a child from the womb of its mother through incisions in the abdominal wall and the womb. This is a very ancient operation and is attempted when it is believed that the child cannot be born by the ordinary channel. The result was formerly fatal in the great majority of cases to the mother if not to the child. Under the modern methods of surgical procedure it is now done with great frequency, sometimes even by doctors of inferior surgical skill and experience, and in most of the cases both the mother and the child recover.

Under the influence of the reforms instituted by Lister the practice of obstetrics is far safer, both for the mother and for the child than ever before. Fifty years ago a maternity hospital was little better than a graveyard. If a mother survived the immediate danger of parturition she was very likely to die from the blood-poisoning or septicæmia which followed. Now, thanks to the influence of Semmelweiss, Holmes, Lister and those who have followed them, a maternity hospital is the safest place in the world for a woman to give birth to her child, not alone because the doctors in such hospitals have more skill than formerly, but because they are clean themselves, and everything around them is clean.

In the treatment of disease great advances have been made. There are many more drugs upon the market than formerly and doctors seldom write out a surgical prescription nowadays. The medicine makers have forced their wares upon the profession, and for every disease it would seem as if there were a hundred remedies. Some of these remedies are valuable, but the greater number are valuable chiefly in the eyes of those who make and sell them and who can induce the public to use them and have faith in them.

But there is one marvelous remedy which

has been brought forward within the past few years which is known as "Salvarsan," or popularly as "606" because its discoverer, Professor Ehrlich, made 605 chemical combinations before he hit upon this one. (This number has since been increased to 914, the new compound being called "Neosalvarsan"). This substance is a compound of arsenic and is used in the treatment of syphilis, which is one of the most deadly diseases, in the wide extent of its ramifications, of all the diseases of which human beings are victims. A single injection of this substance into the tissues will sometimes cure a case of many years' duration. But it is not infallible, it sometimes is followed by bad results, it must sometimes be used during a considerable period of time and its best effects are sometimes obtained when it is combined with a suitable preparation of mercury, which heretofore has been the mainstay in the treatment of syphilis.

Investigations have been constantly proceeding to endeavor to find a cure for that greatest scourge of the human race — cancer. Many so-called remedies have been discovered and announced, only to be quickly abandoned. As cancer is known to be a local disease in its incipiency, it is often cured by the surgeon's knife when attacked sufficiently early and with sufficient thoroughness.

The recent studies of Wassermann and Ehrlich in the endeavor to find a substance, synthetically composed, which shall have a selective action for the cells of cancerous tissues and be inactive upon other tissues seems to have been successful in cancer in mice, which form one of the few species of animals, if not the only one, in which the disease may be transmitted from human beings. If the result should prove what there is great reason to believe it will prove, it would be one of the greatest victories in all the annals of medicine.

Tuberculosis is yielding to the steady attacks which are being made upon it in city and country. It has long been known that it was curable, all that it has needed has been a concerted attack upon it, and now by means of a few drugs, a proper diet, plenty of pure air and an out-of-door life, the conquest of this terrible enemy is almost in sight. Sanitariums and open air institutions of treatment, public and private, for men, women and children are being established in all suitable parts of the country, and the number who are being radically cured of the disease is increasing enormously every year. What is really better is the intelligent perception and comprehension of the disease which will prevent people from contracting it, and in course of time we may expect it will occur with comparative infrequency.

There is no disease into the study of which more enthusiasm has been thrown in recent years than that of tuberculosis and many sanatoria have been established in various parts of the country for the care of the tuberculous.

One of the most important aspects in the treatment of this disease consists in the care of the children of tuberculous parents. It has led to the organization of open-air homes for their treatment. One of the most useful of this class of institutions is the Preventorium, as it is called, which has an estate of 170 acres at Farmingdale, N. J., with suitable buildings and equipment. It takes selected children of tuberculous parents, debilitated and susceptible to disease, between the ages of 4 and 14, to a comfortable place where they will have plenty of wholesome food, 12 hours of rest in bed at night and an additional hour after the midday meal. It gives them two and a half hours of school instruction and requires a few trifling household duties. The remaining eight and a half hours are devoted to play in the woods and fields.

One of the great discoveries of the past 20 years was what is known as the X or Röntgen rays. Their power of making invisible things visible is well known and their application to the photography of the interior of the body has been of priceless value. They have also been used in the treatment of certain diseases, sometimes with alleged success, but often with positive harm. Their influence in producing severe burns, which it is almost impossible to cure, is well known. In not a few cases their use has led to the development of cancer in those who worked with them. Quite a number of physicians have lost their lives as the result of malignant disease produced by their influence.

The influence of serums, vaccines and cultures of bacteria and their products in the treatment of disease is a subject which is now absorbing a vast amount of attention both in the laboratory and in the treatment at the bedside. It would seem as if we were at the threshold of an entirely new order of things in this respect. Fever which has long been considered baneful is now regarded as frequently beneficial.

The bacteria which are constantly in the body are found to be harmful, or beneficial or indifferent according to the conditions of the body. Harmful bacteria when killed and injected into the body may sometimes cure diseases which at other times they would cause. The constituent elements of the blood are ingredients in a great reservoir, some good and some bad, and good or bad according to certain conditions.

The statements which have been made in the last few paragraphs will indicate the trend of thought at the present time, which is largely in the direction of preventive medicine (q.v.). Prevention is, of course, better than cure, and the great object now seems to be to find substances which will make one immune or proof against the attacks of various forms of disease. In pusuance of this doctrine inoculations with properly prepared germs or their products are now made for smallpox, diphtheria, typhoid-fever, lock-jaw, pneumonia and various other diseases. It is a field which is full of promise and of hope.

This article should not be concluded without a word in regard to the great triumphs which have been achieved by the development of sanitary measures. It is known that certain diseases are propagated by insects. Malaria is propagated by a particular species of mosquito and the same is true of yellow fever. It is known that the mosquito breeds in stagnant water. The elimination of these diseases from the places where they abound would seem therefore to be dependent upon the elimination of the mosquito. This has been tried on a grand scale in the building of the Panama Canal (q.v.) and in the cleaning up of the city of Havana. The drainage and sanitation of

the Canal Zone are the work of an army doctor, Colonel Gorgas. Without this work the canal could not have been built. By doing this work the Canal Zone has been transformed into an agreeable health resort.

The recent history of medicine has also been marked by the establishment of sanatoria for the treatment of particular forms of disease and of various institutions and laboratories for special investigation and research. Fifty years ago none of these were in existence. The plan of these institutions is to study exhaustively a single disease or group of diseases, experimenting patiently and continuously upon human beings and animals by means of chemical and biological procedures, by mechanical measures and by means of every other form of assistance which human ingenuity can devise.

This work is prosecuted unceasingly until the cause of the disease is ascertained, and when that point has been reached the study is continued for the removal of the cause or for its effective overcoming. In other words, a life and death struggle is going on between the forces of disease and the intelligence of man as never before, and one after another of the strongholds of disease is being battered down. Not only in this country, but in all the countries of the civilized world has this spirit of inquiry into the cause and treatment of disease infected men as with a consuming fire.

The institutions of investigation and research may be devoted to the study of a single disease, like cancer with its wide ramifications, an illustration of which is the laboratory for the study of cancer at Buffalo, N. Y., or they may take up a single disease, study it until all possible information has been gained, and then take up another disease and treat it in a similar manner.

This is the method of the Rockefeller Institute (q.v.) in New York.

One of the best illustrations of progress in medicine from an institutional point of view is seen in the development of our boards of health and sanitary organizations, municipal, State and national. In many of our cities, especially in those of the first class, they are very highly organized.

Besides the usual care for infectious diseases they have the responsibility for the purity and healthfulness of the water supply, for the quality of the milk supply, including the condition of the dairies from which it is derived, or the quality of the food supply in general, for the ventilation and safety of public buildings, for the sanitary condition of tenement houses, for the inspection of school children and the general supervision of their health, and for a great many other functions which have a bearing upon the public sanitary condition.

One of the most important departments of their work concerns their laboratories where evidences of suspected disease are investigated, diagnoses of physicians confirmed or negatived, inoculation material prepared for the treatment of infectious disease among the poor and a great deal of very useful additional work done of which the public at large knows little or nothing.

Hospitals for certain diseases, especially those which are highly infectious, like diphtheria and scarlet fever, are also under their care in some of the cities, and are means for obtaining valuable data concerning the history of such diseases. Of the sanatoria, public and private, which have been established in recent years for the care and investigation of disease, those which are of a public or semi-public character are, as a rule, the ones which have accomplished most in throwing light upon the problems which relate to disease.

It is impossible here adequately to represent the wealth of contributions to medical science which have been literally pouring in in recent years, both in medicine and surgery (see WAR SURGERY), but a few instances of recent advance will be mentioned. The establishment of the bacterial origin of typhus-fever was announced in 1915, and the fact that it is transmitted by lice and other body insects. The worst epidemic of typhus in modern times began in Serbia and was combated successfully by American physicians under the direction of Richard P. Strong of Harvard University, after it had reached a stage where, in April, 9,000 new cases were reported daily. In the same year an epidemic of the plague started in New Orleans and was successfully confined to a narrow compass by the United States Public Health Service. This included the spraying of buildings, the fumigation of vessels with hydrocyanic acid gas and the extermination of a half a million of rats. This is a highly gratifying result of the improved state of medical education which quickly senses the advantages of public health work. Efforts to improve the knowledge of physicians who have taken their degrees, but who are too much occupied with their work to be able to go to a distant medical school for post-graduate work, are now being made through a system of post-graduate work at home, a plan originating with the Medical Society of the State of Pennsylvania, in a series of clinics and discussions before county medical societies. This plan was also adopted in North Carolina. The Great War in Europe has brought out extraordinary resources in medicine with the result that while the conditions known to former warfare have been repeated on a scale of unexampled magnitude, there have been new elements, such as the intensity of the explosives, causing "shell-shock," and the new features such as poisonous gas. Poison gas, "mustard gas" (dichlorethyl-sulphid) was hurled in shells in liquid form and resulted in burns of various severity. When inhaled it caused inflammation of eyes, nose, throat and lungs. As its poisonous effects are produced only in moist conditions and as it has itself very little odor, the results are not manifest for some time. Distress in the stomach and vomiting ensue after several hours, accompanied with acute conjunctivitis, running of the eyes and photophobia, or oversensitiveness to light, frequently complicated with laryngitis and bronchitis. If the skin is touched by the liquid, burns result producing blistering and desquamation. In spite of the much more deadly methods used in modern destructive warfare, the deaths due to disease have been reduced from 97 per cent of all deaths in the Napoleonic wars, where only 3 per cent died in battle, and in the Boer War, where the deaths from disease were 67 per cent to 4 per cent in the late war.

A tendency to develop research in medical

fields solely through laboratories in which the intimate structure of the body was studied and the influence of the chemical constituents of the various organs upon each other, and that of the pathogenic elements, both endogenous and exogenous, resulted in a high degree of specialization in which the general practitioner found himself at a loss to keep up with the advances in knowledge. He was therefore more and more in the habit of referring his patients to specialists who confined their researches to the physiology and pathology of a single organ, such as the eye, the ear, the stomach, the intestines, etc., and the interrelation of the exceedingly complicated details of physiological process was almost impossible adequately to realize. The weakness of the laboratory and specialist method of treating disease was felt mainly because of the fact that only the advanced or at least well developed stages of the disease came to the laboratories. This procedure failed utterly to take into consideration the registration of the disease in its early stages, a physical condition which is of course actually present, though not visible. These methods, too, relied exclusively on what are known as "physical signs." These, which are but a limited portion of the true symptoms of disease, are among the last to appear as evidence of the presence of a diseased condition. It has therefore been realized that there are symptoms of great importance in certain conditions which may be but premonitory of a later organic disease, and that these symptoms are not physical signs but are mental. This enlarges the function of the general practitioner, whose knowledge of the lives of his patients and of their antecedents is much more valuable for the treatment than any amount of such knowledge collected by laboratory methods could be. It is also in line with a tendency which is most prominent to-day in practical medicine, namely that which has developed the subject of preventive medicine (q.v.) to its present proportions. This recognition of the mental registration of disease antecedent to its physical registration as a physical sign is supplemented by the introduction into psychotherapy of psychoanalysis (q.v.), a procedure which originally included only the mental treatment of mental diseases. But it is now recognized that many physical diseases as well as giving mental signs of their onset before the physical signs have a mental origin, are in other words psychogenic, a point of view which opens a new field not only to medicine but also to education. Indeed it is now seen that much of what was formerly attributed to purely physical causes must now be assigned to faulty or incomplete mental processes. Therefore the modern physician needs to know all he can possibly learn of human psychology and its advances into the knowledge both of conscious life and of the unconscious; and the old materialistic attitude of the physician who thought that the physical signs and the drugs or operation "indicated" constituted the whole of therapeusis, is giving way to that of the modern practitioner who finds that almost nothing is irrelevant to the total situation as presented to him, and that he cannot treat the body exclusively. If he thinks he is doing that, he is shutting his eyes to the very patent fact that by his authoritative position he is producing a mental effect upon the patient which in turn has a secondary physical effect which he cannot afford to ignore. In short it may be said that the field of medicine has in recent years both widened enormously and has at the same time deepened, including as it does not merely the mental signs of approaching illness, as well as the formerly recognized physical signs of its later and well developed stages, but also the unconscious as well as the conscious element in the mental factor, a condition which has quadrupled the sphere of usefulness of the physician of to-day as compared with that of the specialist of yesterday.

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MEDICINE BOW MOUNTAINS, a range of the Rocky Mountains on the west side of Laramie Basin in central Wyoming. Medicine Bow Peak, the highest summit, is 12,005 feet above sea level. Most of the area is a high plateau covered with pine forest and included in the Medicine Bow forest reservation.

MEDICINE DANCE, a common practice among the American Indians; dances being conducted by the medicine men of the tribe for various purposes, and in preparation for different events, like warfare, the hunt, etc. Both in the dance before a battle and in the conflict itself the medicine chief is the one man most worthy of consideration. If war takes place he courts the thick of the fight if for no other reason than to show his immunity from danger. The funeral dance of the Yaqui tribe is a representative example of the medicine dance; the chief medicine man arranging the ceremony, which ensures the safe passage of the dead to the spirit world. The dancers to the number of half a hundred appear in the centre of the assembled tribal gathering, naked except for a cloth about the loins. Their bodies are painted in imitation of skeletons. Over their heads they wear masks fringed with long horse-hair, dyed in many hues, eyelashes and eyebrows hang over the rudely designed faces and beards reach nearly to the waist. On their legs they fasten strings of rattles cut from rattlesnakes, and the sound of these is most grewsome to the spectators. Each dancer carries two knives, one in each hand, with which he gesticulates violently in imitation of the act of slaying imaginary enemies. Every man dances after his own ideas, each seeming to outdo the other in the violence of the motion. Music for the dance is furnished by tomtoms. After the dance a great feast follows, continuing until midnight.

MEDICINE HAT, Canada, a city in the southeast corner of Alberta, 600 miles west of Winnipeg and 167 miles southeast of Calgary,

in lat. 50° 2′ N., and long. 110° 40′ W., and is 2,181 feet above sea-level. It is situated on the slope of the South Saskatchewan River which gives it a drainage much superior to towns on the open prairie. The city took its rise in 1883 from the advent of the Canadian Pacific Railway. It is on the main line of the railway and is the terminus of the Crow's Nest Line. For many years it remained a centre for the cattle ranching industry for which the surrounding country was excellently suited, the chinook winds which prevail in this part of the country enabling the horse and cattle to range in the open throughout the winter as during the summer. But the large ranches are rapidly disappearing as the land is being brought under cultivation by the homesteaders. In 1899 Medicine Hat was incorporated as a town and in 1907 as a city. As its earlier development was due to ranching and then farming its late development is due to the rise of manufactures. Like Lethbridge it is one of the four principal coal mining centres of the province but its most valuable resource is gas. It lies in the centre of one of the largest fields of natural gas on the continent. The gas was first discovered about 1885 when the Canadian Pacific Railway bored on the banks of the river to find coal deposits. The first gas well was drilled in 1890 by a company of local citizens. For many years the gas was gradually developed for domestic consumers but from 1909 it has been more extensively developed as a cheap and excellent fuel for manufacturing purposes. Both gas engines and steam boilers heated by gas are used. The analysis of the gas is as follows: methane 99.49 per cent; hydrogen .51 per cent; B.T.U.s per cubic foot 1,100. The city has 17 gas wells with an average daily open flow of two million cubic feet and distributes this to domestic consumers at 15 cents and to manufacturers at 5 cents per 1,000 cubic feet. The city owns and operates its own utilities. The electric plant and the water plant are operated in conjunction, the same boilers producing the power for operating the pumps and the dynamos. The city water supply, taken from the Saskatchewan River, is passed through a sedimentation basin and filter beds and is pumped to a reservoir on a hill overlooking the city from which it is carried by gravity pressure. There is also a sanitary sewage system, the sewage being deposited in the river some distance below the city. The streets are all 66 feet wide, are all macadamized and have been well planted with trees. The sidewalks are of cement. The manufacturing and business section is built of brick while the private residences are mostly of wood construction. There is a dry-farming demonstration farm, also a business college, a general hospital, a grain elevator, flour, linseed-oil, rolling and planing mills, brick works, a steel plant, lumber, glass works, foundries and machine shops. Pop. 9,272.

MEDICINE MAN, among the American Indians, South Sea Island tribes and other savages, a man supposed to possess mysterious healing powers. Among most savages the medicine man occupies much the same position as that held in civilized communities by two of the learned professions — medical and clerical. The medicine man is both priest and physician, and is at once the repository of all that a tribe knows, fears and believes. In very low stages of human development, however, he is at best only a magician, dealing in terrors, possessed of occult powers, but laying claim to no special medical knowledge. Thus, among the aborigines of North Queensland, the tribal doctors do not attend on the sick — an invalid being cared for by wife or mother. They are not ostentatious, a medicine man being distinguished by no insignia save a small bag for his talismans, death charms and other "credentials." Among the North American Indians medicine men are treated with great respect, and form a secret society with exclusive privileges and "exercise a terrible influence in degrading the people." It is curious to find that, as in Australia, the Indian medicine men are chiefly concerned to do positive harm. In co-operation with good and bad spirits, they bring about the deaths of men or dogs at a distance. Among the Ojibways they are a kind of brokers in vengeance, and a coward or a hypocrite who wishes to be covertly avenged upon an enemy will bribe his tribal medicine man to employ the medical attendant of his victim. Then, if the victim dies, the instigators remain, unsuspected, and the actual perpetrator of the crime probably goes scot free. Indian medicine men affect to suck out poison from a patient's body, or they cough up an arrow point or small, sharp piece of stone or bone which they suppose has been transferred from him to them by the evil spirit of another sorcerer. The medicine men of the Eskimos are even more extravagant in their pretensions. They profess themselves able to change into wood, stone or animal, or even to walk on the water, or to fly, but they make a condition, which is that "no one must see them." See INDIANS.

MEDICINE AND PSYCHIATRY, Psychology in. Although the great power of suggestion has been recognized from the earliest human times and the powerful influence of the mind on the body somewhat understood for centuries, the medical schools obviously have in general belied their high privilege of first studying and then teaching the relations and mutual dependence of body and mind. They have neglected psychology. It has been a characteristic of modern scientific medicine that it has *integrated* inadequately, and therefore been unduly narrow (in this respect) in its range,— these two facts indeed being but natural results of the plain over-guidance by the tradition of materialism. And this is strange to the average man and unaccountable to a degree, for the best English and, to a less extent, French attitude was one of adequate and practical realization of the health's frequent dominance by the mind, and the width and depth and misunderstood complexity of the influence of that which we designate as mental. John Locke influenced the experience of early English medicine more than did the materialist Thomas Hobbes; but America somehow narrowed if it did not "harden" its medical heart.

The practical result of this trend has been a regrettable, not to say surprising, slowness in medical education's recognition that the practitioner invariably should know the broader rudiments at least of psychology; have systematic, however brief, acquaintance with the founda-

tion-principles of the relation of body and mind; and above all be forced to realize, against the old traditional materialistic prejudice, that every patient is mind quite as importantly as body. Every reader knows this for himself.

Because, in part, of his varied education, the present writer was almost a pioneer in practical attempts to correct this particular narrowness of American medical education, although laboring meanwhile under quite characteristic difficulties, such as the tradition of the schools and lack of time and of funds. To repeat part of an article in *Science*, 18 years ago (26 July 1901):

The education given to the medical student seems in general too grossly materialistic, too somatic. He learns but one side of this two-sided story; from the first year to the fourth, from the dissecting room to the gynecological or otological clinic the routine student sees and hears of muscles and bones, and viscera, sense-organs, nerves and vital fluids, but little, unaccountably little, of that other aspect of men and women which to these very men and women is their life, while these other, these organs, are but needful instruments of that life's attainment. And their point of view, it need not be said, is also that of philosophy; shift it, and illogical confusion follows. The layman cares little or nothing for his stomach's condition so long as it gives him no pain and takes good care of what his will and his appetite lead him to supply to it. The woman in search of a happy family life thinks seldom of her reproductive mechanism so long as it gives her healthy children whom she can love. There is something beside cell-built tissue for the gynecologist in charge of an operative case to consider when of two women, alike in vigor, who undergo identical ovariotomies, for example, one goes in three weeks from the hospital a new woman, cheerful, capable and happy, while the other becomes an hysteric wreck never perhaps to equal her former self in happiness or in health. As every surgeon knows, such differences are met continually and they puzzle him. Why is it that present medical education takes no account of the principles underlying phenomena like this?

So far as the student is concerned, the course, four years or three years long, quite ignores in general the emotional and temperamental factors which in one way or another, directly or indirectly, less or more, enter into almost every chronic case and into many of the acute cases which the general practitioner is called upon to treat. Instead of striving to teach the student what conditions underlie mental habits and idiosyncrasies, medical instructors are now content to practically ignore them regardless of possible great benefits to come from their study as psychological data.

Too often is the medical man the most materialistic-minded member of a community, when his view should be much deeper, into the controlling forces of life. This is the natural outcome when in a long medical course no part of the individual is shown to the student except what he can feel with his hands or see through the microscope. Yet how commonplace is the assertion that the man, the real man or woman, is not his or her body, but the will, affections, habits, character, of the individual, while (what is more immediate to our argument) these same aspects of consciousness are often the direct molders, or destroyers of disease and, as one side of an inseparable psychophysical organism, have more control or influence over the functions purely somatic than the average practitioner of medicine appreciates. Not mind controlling body nor body controlling mind, but both together always sensitive to the stimuli of a common environment, combined into the actual individual.

The whole trend of modern biologic science is toward the appreciation that neither factor of personality, body or mind, in justice to the medical student and through him to the public may be longer ignored.

Agreeably to such convictions, the catalogue of the Tufts College Medical School of 1900–01 contained announcement of a course in "Normal Medical Psychology." This was continued for nine years, when by arrangement with Prof. Morton Prince, it was developed into a course termed "Psychopathology and Psychotherapeutics." In 1912 (for lack of funds to pay the lecturers) the psychological work was abandoned. Such a record of pioneer development in medical curriculum is instructive in several respects to all of those who believe that a physician should realize that his patients have minds influential to a degree at present quite indefinable but more and more appreciated. So far as known, the Johns Hopkins medical department alone preceded in the practical and systematic realization of this basal fact.

The slowness with which adequate courses in normal medical psychology are made required parts of medical curricula, is another depressing sign of the essential narrowness of the average professional outlook into life and philosophy, just as it is another evidence that medicine is for some of its practitioners still largely a trade wherein no facts are either of interest or desirable, no breadth of view admittable, that has not a bank-note or its equivalent closely attached. Hasten the progressive day when without the broadening education of the college bachelor's course at least no man or woman shall be allowed for gain to take charge of the human personality of a fellow mortal! For without his psychology he knows only about half of the being whom he pretends thoroughly to understand.

The reasons in particular for this insistent need of psychology in medical education the writer already in part has summarized in an article in the New York *Medical Record* of 30 Jan., 1909.

The Physician's Need of Psychology.—The most obvious and immediate need for systematic medical psychology comes, of course, from psychiatry and neurology. That the demand does not come even more insistently than it does from the teachers of these subjects, especially of the former, is one of the anomalies of the whole matter. When one does not expect a student to understand the deranged movements of the heart who has never seen a healthy heart or a representation of one, why should the multitude of third- and fourth-year men who know nothing of the processes of perception and imagination be expected to comprehend an hallucination? Or those who have never been told of the mechanism of the emotion of fear to understand the depression and misery of melancholia? One asks too much in

expecting any man to really comprehend a case of paranoia who has no notion of the processes of ideation. And neurasthenia, the bread-and-butter malady to practitioners of nervous disease, does any suppose it is not so intertwined with mental relationships that to unravel it in full is to make use inevitably of no little various and intricate psychology? The modern variants of the "rest cure" require a knowledge of the motor relationships of the mind, and else this valuable system of retraining the mind back to health through controlled voluntary use of the muscles would lose much of its precision and basal usefulness.

In a less technical way, perhaps, but quite as importantly in the long run, the surgeon as a surgeon needs to be familiar with mental processes. It is especially important that he should realize the often surprising life-lengthening support and stimulation, technically called dynamogeny, that belongs to the joyful emotions. Scarcely less useful oftentimes, explain it as one may, is the vitalizing influence of determination, of vigorously expressed will to thrive and to live. Aristotle and John Hunter down to the latest of them all agree in admitting these facts, however the future science of normal medical psychology shall in detail interpret and explain them. Does the sceptic (if such, perchance, persist into these "latter days") know of a single really great surgeon who does not inevitably inspire the almost perfect confidence of every patient under his care? Can the master-surgeon actually cut us up invariably so much better than his struggling neighbor in the next block uptown? Or is his far greater success due in part to his exaction of confidence in his knowledge of human nature as really it is — mind as well as body,— giving us confidence and so inspiring hope and all the guarding and reparative powers of pleasant and stimulating emotion? The physiology and psychology of this important influence we now fairly well understand.

In a still more general way, the successful practitioner in medical cases as distinct from surgical, consciously or otherwise, uses the principles of psychology in a very large proportion of his practice. One need not attempt the laborious task of specification here, for every practitioner must nowadays realize to some extent the mental factors in every complex disease.

The Need of Psychological Instruction for Breadth.— In all departments of the science of medicine there is always an urgent demand for a broader outlook than the average medical student can obtain without a preliminary college course. It is easy to underestimate the influence and the importance to humanity of the profession of medicine.

Medical philosophy reaches out into almost every aspect of human relationship, and thus it pervades, and in considerable part directs, every phase of modern human society. That it does not do so to even a greater extent than it does is largely because the nature of personality is not adequately studied in the medical school. Many phases of the individual are often exhaustively considered, but at present it is no one's business to combine these scattered parts into the wholeness of the individual child or man or woman. And yet every patient is an individual, a personality, and has a heart and kidneys and nervous system and all the rest only as parts ministering to this personality. It is one of the important tasks of the medical psychologist to weave these scattered threads of organic knowledge into this actual personality. Then at last the average physician will know, in some measure at least, how to follow the sound advice of the numerous orators at commencement who advise the graduates "to treat not the disease but the individual suffering from the disease." The somatic aspects of the man are adequately treated in many, and perhaps in most essential, respects, but of the inner side of the "arc of personality" one hears but little as yet from the teaching faculties of medicine. The tide, however, is coming in!

The psychology of sex is a phase of education for which there is continually a more obvious demand from a grossly wronged and degraded society, and consequently from educators.

The course in legal medicine in the medical schools demands for its greatest usefulness the basis of psychological knowledge which should precede it in the curriculum. Human misery and crime often depend on motives more psychical than physiologic.

Psychology's Influence on the Physician Personally.— Medical instruction in psychology undoubtedly would make the physician more sympathetic with his patients than sometimes he now is. With this added sympathy he would serve them better because more understandingly. He would tend to approach then the ideal of the oldtime family practitioner, "guide philosopher and friend." Knowledge of the processes and relations of mind would be to the physician himself a source of great and unending satisfaction. Related to it is not only the knowledge of human nature, that never tiring source of interest and delight, but psychology leads outward in all directions into the true wisdom of divine philosophy.

In 1913 the American Psychological Association, by a committee, investigated the status of psychology in American medical schools. One of the questions asked the deans related to the advisability of special instruction in psychology. Of the 71 schools (only 71) answering this question, 73 per cent replied in the affirmative, 12 per cent in the negative, while 15 per cent gave a qualified answer one way or the other. How slow is the recognition that emotions and ideas control the body!

Psychology in Relation to Psychiatry.— It is obvious that the medical care of insanity cases, if more than "asylum" is to be offered these "unhappy" souls, must depend as much on the physician's knowledge of psychology as on somatic medicine. At present it is in a widespread area of our country nothing less than a reproach that so few professional psychologists are trying to relieve and to cure the insane. In every case, from the irrational paranoiac to the terminal dement, much knowledge of the normal mind would seem to be a not wholly unreasonable requirement in an attending physician! As yet the percentage who have such knowledge is so small as to constitute a reproach to organized medical efficiency and nothing less than that. Even the superintendents of these institutions conducted for the cure or the care of diseased minds are seldom or never psychologists. And still many

of the hospitals have no such modern improvement about the place.

GEORGE VAN NESS DEARBORN,
Medical Corps, United States Army.

MEDICINES. See CHEMISTRY, PROGRESS OF.

MEDICK, a plant genus of the natural order Leguminosæ, native of the temperate and warm belts of the Old World. The pods have spiral twists and the genus includes very many species, both annual and perennial, with trifoliate leaves closely resembling the clovers. Some species have been introduced into the United States, of which lucerne and alfalfa are economically the most important. Several Russian species which require little moisture have recently been introduced in the arid and semi-arid regions of the West and have been proved a success. See MEDICAGO, and consult 'Bulletin 108' of the Texas Agricultural Experiment Station (1908) and 'Bulletin 165' of the Alabama Agricultural Experiment Station (1912).

MEDILL, mĕ-dĭl', **Joseph,** American journalist: b. New Brunswick, Canada, 6 April 1823; d. San Antonio, Tex., 16 March 1899. Having early removed to Massillon, Stark County, Ohio, he was admitted to the bar in 1846, practised at New Philadelphia, and in 1849–51 published at Coshocton the *Republican,* a Free-Soil paper. In 1852 he established at Cleveland the *Forest City,* a Whig organ, which in 1853 was united with the *Free Democrat* and called the *Leader.* In 1855 he sold his interest in the *Leader,* removed to Chicago, with two partners purchased the *Tribune,* advocated radical anti-slavery measures and supported Lincoln in 1860. He was a member of the Illinois constitutional convention of 1870; United States civil service commissioner in 1871 and in that year was elected mayor of Chicago. In 1874 became editor-in-chief of the Chicago *Tribune,* in which relation he remained until his death. It was largely due to his individual efforts that the city of Chicago was selected for the World's Fair of 1893.

MEDINA, José Maria, hō-sā' mä-rē'ä mā-dē'nä, Central American politician: b. Honduras, about 1815; d. Santa Rosa, 8 Feb. 1878. He was president of Honduras in 1862–63 and was re-elected in 1864–66 and in 1870. The war with Salvador in 1871 disturbed his hitherto successful administration and at the next election he was defeated by the Liberal party who elected their candidate Arias. Defeated again by Leiva in 1874 Medina raised an unsuccessful revolt in 1875–76 and in 1877 a second revolt was punished with death by court-martial.

MEDINA, José Toribio, Chilean bibliographer: b. Santiago de Chile, 1852. He received his education at the National Institute and the University of Santiago, being graduated in law at the latter institution in 1873. At the age of 22 he was appointed secretary of legation at Lima. In that city he made investigations in the archives and in 1878 after his return to Chile he published a history of Chilean literature. Already in 1874 he had published a metrical translation of Longfellow's 'Evangeline.' In the war with Peru, Medina served in the army and at the close of the war was made judge in the provinces ceded by Peru. He was made secretary of legation at Madrid in 1884 and here also he delved into the Spanish archives dealing with the Spanish in America and especially the history of Chile. He returned to his native country after several years' residence in Europe. He went abroad again in 1902 and also visited the United States to make further historical studies. Medina's great work is the 'Biblioteca hispano-americana, 1493–1810' (7 vols., 1898–1907), which contains notices of 10,000 works. Other bibliographical works are 'Historia y bibliografia de la imprenta en el antiguo virreinato del rio de la Plata' (1892); 'La imprenta en Manila desde sus origenes hasta 1810' (1896); 'Biblioteca hispano-americana septentrional' (1897); 'Biblioteca hispano-chilena, 1523–1817' (3 vols., 1897–99); 'La imprenta en Bogotá, 1739–1821' (1904); 'La imprenta en Guadalajara de México, 1793–1821' (1904); 'La imprenta en Guatemala, 1660–1821' (1910); 'La imprenta en la Habana, 1707–1810' (1904); 'La imprenta en Lima, 1584–1824' (4 vols., 1904–07); 'La imprenta en México' (1907—); 'La imprenta en puebla de los Angeles, 1640–1821' (1908); etc., etc. Medina's historical works are also important since they are based on manuscript sources. They include 'Historia de la Inquisición en Lima' (1887); 'El Tribunal del Santo Oficio de la Inquisición en Chile' (2 vols., 1890); 'Juan Diaz de Solis' (2 vols., 1897); 'La Inquisición en las Islas Filipinas' (1899); 'La Inquisición en México' (1905); 'El Portugués Estebán Gomez' (1908); 'El veneciano Sebastian Caboto' (2 vols., 1908); 'Medallas coloniales hispano-americanas' (1900); 'La instrucción pública en Chile' (2 vols., 1905); 'Diccionario biografico colonial de Chile' (1906). He edited 30 volumes of 'Colección de documentos ineditos para la historia de Chile.' Consult Chiappa, V. M., 'Noticias acerca de la vida y obras de Don José Toribio Medina' (Santiago 1907).

MEDINA, or **MEDINEH,** mę-dē'na, Arabia, the native Medinah-al-Nabi or City of the Prophet (also Medinat Rasul Allah, City of the Apostle of God), 500 miles southeast of Palestine, 250 miles north of Mecca and about 110 miles east of Yembu on the Red Sea. It is reached from Damascus by an 820-mile railway journey. The city is celebrated for containing the tomb of Mohammed, whence it ranks second to Mecca as a pilgrimage resort of Islam. It is situated in the most fertile spot of all Hejaz, the streams of the vicinity tending to converge in this locality. An immense plain extends south from it; in every direction the view is bounded by hills and mountains. The town forms an oval, surrounded by a strong stone wall, 30 to 40 feet high, that dates from the 12th century, and is flanked with towers, while on a rock, at its northwest side, stands the castle. Of its four gates, the east Bab-el-Misri, or Egyptian gate, is remarkable for its beauty. Medina has no large buildings except the great mosque, two smaller ones, a college and public baths. The houses are of stone, two stories high. Beyond the walls of the city, west and south, are suburbs consisting of low houses, yards, gardens and plantations. These suburbs have also their walls and gates. The mosque of the Prophet stands at the east side of the city and resembles that at Mecca on a smaller scale. Its court is almost 500 feet in length, the dome is high and the three minarets picturesque. The tomb of the Prophet, who died and was buried here in 632, is enclosed with a

screen of iron filigree, at the south side of which the pilgrim goes through his devotions, for all of which he pays, but is consoled with the assurance that one prayer here is as good as a thousand elsewhere. The tombs of Fatima (Mohammed's daughter) and Abu Bekr (father of his wife Ayesha), and of Omar, the first calif, are also here. The mosque dates from the period of Mohammed, but has been twice burned and reconstructed. Omar and Othman both enlarged the original simple brick structure. It was again enlarged by the Calif Walid, so that it enclosed the three tombs. It was destroyed by lightning, probably about 850, and the graves almost forgotten. In 892 the place was cleared up, the tombs located and a fine mosque built, which was destroyed by fire in 1257 and almost immediately rebuilt. It was restored by Khaid Bey, the Egyptian ruler, in 1487. It is estimated that one-third of the pilgrims to Mecca go on to Medina, the pilgrimage to which may be performed at any time of the year. In the time of Ptolemy the town was known as Lathrippa. There never was much population until the place acquired fame as a resort for pilgrims. The city has been built up by acquisitions from visiting pilgrims, who recognized the opportunities for making money here by catering to visitors. For this reason the local people are heterogeneous and stand for nothing but keeping up the crowd of pilgrims. Since 1814 Medina has been the capital of the north pashalic of Arabia. Pop. 40,000. In June 1916 the Grand Shereef of Mecca proclaimed his independence of Turkey. Mecca thus, with the founding of the new kingdom of Hejaz, was lost to the Turks; Medina held out, however, until 13 Jan. 1919, when the Turkish garrison under Fakhri Pasha surrendered to the Emir Abdullah, the representative of King Hussein of Hejaz. Consult Burton, Sir Richard Francis, 'The Pilgrimage to Al-Medinah and Meccah' (London 1855). See MOHAMMED.

MEDINA, mẹ-dī'nạ, N. Y., village, in Orleans County, on Oak Orchard Creek and on the Erie Canal, and on the New York Central and Hudson River Railroad, about 35 miles northeast of Buffalo and 12 miles from Lake Ontario. The first settlement was made about 1830. In 1832 it was incorporated as a village. It is in a fertile agricultural region in which the chief products are grapes, apples, strawberries and other fruits and dairy products. In the vicinity are valuable sandstone quarries from which is obtained excellent building stone. The water-power is excellent and has been increased by a storage dam. Electricity is used as a power in manufacturing as well as for light. The chief manufactures are pumps, iron, foundry products, shirts, shoes, vinegar, flour and furniture. It has a large trade in fruit and sandstone. The Medina Falls are visited annually by a number of tourists. The government is vested in a president and board of trustees. Pop. 5,683.

MEDINA, Ohio, village and county-seat of Medina County, on the Baltimore and Ohio and Northern Ohio railroads, 30 miles southwest of Cleveland. Here are located the Sylvester Library, the Pythian Sisters' Home and Spring Grove Cemetery. Its industrial establishments comprise bee-supply works, foundries and bending works. Pop. 2,734.

MEDINA SERIES, *in geology,* a term introduced by the New York Geological Survey for a subdivision of the Upper Silurian series apparently the base of that system. It is named from Medina, N. Y.; occurs throughout the Atlantic States; and includes shales, conglomerates and sandstones. For the Medina sandstone see LEVANT.

MEDINA SIDONIA, mā-dē'nā sē-dō'nē-ä, Spain, a city in the province of Cadiz, 20 miles southeast of Cadiz and 55 miles northwest of Gibraltar, built in the form of an amphitheatre on a broad eminence, in the middle of an extensive plain, noted for its agricultural products and cattle rearing, which constitute the chief occupations of the population. A fine Gothic church, a town hall and the ancestral palace of the famous dukes of Medina Sidonia are the principal buildings. Pop. about 11,000.

MEDINET EL FAYUM, Egypt, capital of the province of Fayum, on the Bahr-Yusuf, 155 miles south of Cairo. It contains a fine bazar and a mosque. It has an extensive trade in grain, woolens and roses. Woolens are manufactured. An American mission is established here. Pop. 37,320.

MEDITATIONS OF LAMARTINE. The 'Méditations' (1820) and 'Nouvelles Méditations' (1823) of Lamartine should be counted rather as heralds of the Romantic School of French poetry than as products of it. The former, its author's first publication — he was then 30 — appeared five years after Waterloo. Its sentimentalized melancholy voiced so admirably the temper of that period of political reaction and moral exhaustion that it achieved a success in its day hardly paralleled. Its appeal was to the cultured only, but 40,000 copies of the 'Méditations' were sold in four months. The modern reader must strive to realize the temper of 1820 if he would comprehend how these rather thin and always superficial reflections on the relations of man to «Nature» — a creation of the poet's morbidity, with little relation to reality — rather than to his fellowmen found admiration so ardent, that successive volumes of verses, in his own phrase, «fell from my pen like drops of evening dew,» while the poet found himself «incapable of the exacting labor of the file and of criticism.» «The soul of the poet,» he writes in a volume of 'Confidences,' «is a running brook which writes its murmurs and sings them, but we write them with human notes and Nature with the notes of God.»

The 'Méditations' were the work of an army officer, but it was the army of the Restoration, more responsive to Rousseau's call for a return to nature and to Chateaubriand's for a return to religious emotionalism than it was to any summons to action. When that mood passed and France recovered the energy that showed itself in politics by the Revolution of 1830 and in literature by the Romantic School, the 'Méditations' soon came to be little read though still conventionally admired. Unquestionably, however, they were the most complete literary reflection of the sentiments and aspirations, the self-deceptions and illusions of the generation of 1820. This gives them a lasting value, greater than their merit of content or of form.

Lamartine's verses preserve much of the

verbal mannerisms of the earlier period. They are harmonious, refined, delicate, graceful, sincere, spontaneous, "the indolent pleasure of a too-richly gifted mind." On the other side they are conventional in expression, monotonous in feeling, elusive in development. The themes are throughout those of the true lyric — nature, love, death. The essence of all Lamartine's voluminous poetic effusion can be seen in its full potency in some of the very earliest of the 'Méditations,' for instance, in The Lake (Le Lac), accounted by some to be Lamartine's best poem, in Loneliness (L'Isolement), and in the vague pantheistic melancholy of Prayer (La Prière). In the 'Nouvelles Méditations' the poet's congenial marriage is reflected in the happier vein of the Love Song (Chant d'Amour), Wisdom (La Sagesse), Ischia and The Preludes (Les Préludes), but the poet soon resumes the melancholy pose. The Ode on Bonaparte in this collection goes deeper and rises higher than is usual in Lamartine; as indeed there is unwonted grace in Ischia and force in The Crucifix. Never so popular as the earlier book, 'Nouvelles Méditations' are preferred by many critics, and Brunètière even pronounced them "at once the noblest and the most *voluptueux* in French poetry." It is juster to say, with Lanson, that if, and so far as, poetry is essentially sentiment, disengaged from the ideas and facts that produce or accompany sentiment, the 'Méditations' are great poetry and Lamartine is among the most poetic of poets. Consult 'Life of Lamartine' by H. R. Whitehouse (New York 1919).

BENJAMIN W. WELLS,
Author of 'Modern French Literature.'

MEDITATIONS OF MARCUS AURELIUS, The. There is probably no more romantic story of a book in the history of literature than that of the volume known as the 'Meditations of Marcus Aurelius.' It is merely the commonplace book or diary of a Roman emperor (121–180 A.D.), who at the end of a very busy and troublous reign, just when worries were thickest, jotted down all the serious thoughts that came to him with regard to the meaning of life and the way it should be lived. He called his little book simply "To Himself." It was probably meant only for his own perusal when he was in meditative mood. He so loved the Greek Stoic philosophers whose writings had been his inspiration and consolation that he wrote in Greek. It is not good Greek any more than the 'Imitation of Christ' is good Latin. He paid little attention to the style of it, and yet Headmaster Rendall of Charterhouse in his Introduction to the 'Meditations' does not hesitate to say that "in the whole range of Greek literature, no work (excepting the New Testament) has wider vogue and currency than these untutored meditations of the imperial moralist."

The book created a *furore* in the Renaissance when it was first edited and printed, but it has never ceased to be the favorite reading of thoughtful scholars. John Stuart Mill declared the 'Meditations' as "almost equal in ethical elevation to the Sermon on the Mount." Matthew Arnold went so far as to say that "Marcus Aurelius remains the especial friend and comforter of all clearheaded and scrupulous, yet pure hearted and upward striving men in those ages most especially that walk by sight, not by faith, but yet have no open vision." Americans will be interested to know that the 'Meditations' of Marcus Aurelius were with Machiavelli's 'Art of War' the daily study of Capt. John Smith, the Virginia pioneer whose romantic history might seem to indicate some less stern and stoic reading. The Roman emperor's little book has often since been the daily resource or even the boon companion of men of action in the field as well as of statesmen worried over matters of politics, and of scholars with time on their hands.

It has been suggested that perhaps this last of those Spanish Cæsars, under whose rule for 80 years Gibbon thinks that the world was happier than it has ever been before or since, had the idea while he was jotting down these scattered thoughts on life that some time or other they might be of service to his son Commodus. If that were so, the book might serve as the contrast to Chesterfield's letters. The modern English nobleman wrote an epitome of worldliness; the ancient emperor a manual of otherworldliness. But if Marcus Aurelius wrote for the eye for his son, he was sadly disappointed, for Commodus was probably one of the worst rulers of history. For his weak selfishness no advice would have availed.

The 12 books treat of: I, The debts that he owes for all that has come to him in life — (here are tributes to his grandfather — his father died when he was very young — to his wife "so docile, so affectionate, so simple," and to many dear friends); II, On doing what you do; III, That to obey God is liberty; IV, That there is no such thing as chance; V, On the real goods of life; VI, That the inner life is all that counts; VII, On repressing impulse and finding self-content; VIII, On equanimity; IX, Fate leads the willing man, but drags the unwilling; X, Look around you, look behind you, look ahead of you; XI, Unselfishness; XII, (In conclusion) "Depart then satisfied for he who also releases thee is satisfied."

When the Emperor Julian whom the modern world knows as the Apostate would sum up the life of Marcus Aurelius in a single phrase he gave an excerpt from a dialogue supposed to take place not long before his predecessor's death: "Then Hermes, looking at Marcus, said, 'And to you, Verus [Marcus' family name], what seemed the noblest end of life?' Quietly and gravely he replied, 'The imitation of God.'"

Consult Watson, 'Life of Marcus Aurelius' (New York 1884); 'Marcus Aurelius,' in Matthew Arnold's 'Essays in Criticism'; Rendall, 'Marcus Aurelius Antoninus' (London 1901); Long, 'The Meditations of the Emperor Marcus Aurelius Antoninus' (London 1862); Canon Farrar, 'Marcus Aurelius,' in 'Seekers After God.'

JAMES J. WALSH.

MEDITERRANEAN (med"i-tē-rā'nẹ-ạn) **SEA,** the great inland sea between the continents of Europe, Africa and Asia, the remnant — according to Professor Suess — "of a great ocean which at an early geological epoch, before the formation of the Atlantic, encircled half the globe along a line of latitude." From its eastern extremity in Syria to the Strait of Gibraltar it is about 2,300 miles long; its maximum width from Venice to the Bay of Sidra

is 1,200 miles; its average width 300 miles. Its area is variously estimated as from 815,000 square miles to 1,145,000 square miles. The shores of Europe are on the north and northwest, those of Africa on the south and those of Asia on the east. The Mediterranean is connected with the Atlantic by the Strait of Gibraltar, and on the northeast with the Black Sea through the Dardanelles, Sea of Marmora and the Bosphorus, which form a continuous waterway. It is irregular in shape and by the projection of the south part of Italy, and of Cape Bon in Africa and the interposition of the island of Sicily, is divided, near its centre, into two distinct portions, an east and a west. In addition to these, the other important subdivisions are the Tyrrhenian or Tuscan Sea, between the west coast of Italy and the islands of Sardinia and Corsica; the Adriatic Sea or Gulf of Venice, between the east coast of Italy and the west coast of Turkey in Europe and Dalmatia; the Ionian Sea, between the west coasts of Turkey in Europe and Greece, and the south part of Italy and the island of Sicily; the Ægean Sea or Archipelago, between Turkey in Europe and Greece on the west and Turkey in Asia on the east; and the Levant, which is usually understood to include the whole sea east of the island of Crete. The largest gulfs are, on the shores of Europe, those of Lion or Lyons, Genoa, Taranto, Lepanto, Koron, Kolokythia and Salonica; on the shores of Asia, Adrymiti, Smyrna, Adalia, and Skanderoon; and on the shores of Africa, Sidra and Cabes. The largest and most important islands are Sicily, Sardinia, Corsica and the Balearic Isles, in the west division; and Cyprus, Rhodes, Crete, the Ionian Isles and Malta, in the east division. The principal rivers which discharge themselves into the Mediterranean are the Ebro, Rhone, Po and Nile; but its communication with the Black Sea entitles it to claim it as part of its basin, and, consequently, also the great rivers Don, Dnieper, Dniester and Danube. Between Cape Bon and the Sicilian coast, where the sea is shallowest, the depth varies from 30 to 250 fathoms; but in almost all other places, particularly at a distance from the shores and islands, the depth is very much greater, the maximum depth in the eastern division being 2,150 fathoms, in the western division, 2,040 fathoms. The mean depth is practically equal in the east and west divisions, about 883 fathoms. However, half the area is less than 500 fathoms deep. The depth temperatures are very much warmer than in the Atlantic. Owing to the very narrow channel which connects the Mediterranean with the main ocean, there is very little tide; though in some places, as in the Ionian Sea, the Adriatic, on parts of the African coast, etc., a rise of more than six feet sometimes occurs. The prevailing winds are the southeast and southwest in spring, and the northeast and northwest during the rest of the year. They often rise suddenly and with great violence. The most remarkable are the historic Euroclydon or Levanter, mentioned in Acts xxvii, 14, a northeast wind of dangerous whirlwind characteristics; the Bora in the Adriatic; the Etesian and Tramantona in the Ægean; and the burning Sirocco from the African desert. The Mediterranean abounds with fish, some 400 species having been noted, and also furnishes the finest coral and sponge. The evidences of volcanic action along its shores are present in the active volcanoes of Vesuvius, Etna and Stromboli (qq.v.). Consult Playfair, 'The Mediterranean, Physical and Historical' (1890); Cook, J., 'The Mediterranean and Its Borderlands' (Philadelphia 1910).

MEDITERRANEAN SUBREGION, a zoogeographical district of the Nearctic Region embracing the basin of the Mediterranean and the plains of Syria. Faunistically this region is allied to Europe rather than Africa or Asia, from which it is separated by deserts. It includes many sub-tropical forms, rarely or never seen north of the Alps or south of the Atlas Mountains. See ZOOGEOGRAPHY.

MEDJIDIE, mĕ-jĕd'ē, a Turkish order equivalent to knighthood, instituted by the Sultan in 1852. It has been conferred on numerous foreign officers, soldiers and seamen, who have taken part in wars on behalf of Turkey. It is divided into five classes, indicated by the difference in size of the decoration. Recipients of the first order, in addition to the large gold and red decoration, receive a star to be worn on the left breast. The accompanying ribbon is red and green. The name is also given to a modern Turkish silver coin, value about 85 cents.

MEDLAR, a small tree or shrub (*Mespilus germanica*) of the apple family and a native of southern Europe where in the wild state it has thorns, but in cultivation it is thornless. It differs from various near relatives such as apple and pear, in bearing solitary large, white, terminal flowers upon leafy growths of the current season, and, like the quince, in having no detachable peduncle to the fruit in which the receptacles do not completely overgrow the ovaries. It is widely grown in Europe but much less in America. In Central New York it is fully hardy and produces well with no special care. The top-shaped fruit, which is about the size of a small pear, should be allowed to hang until after a frost, which mellows its austerity and assists the process of "bletting," as ripening in cool dry rooms is called. When in a state of incipient decay the softened fruits are eaten by those who enjoy tart flavors, or are made into preserves.

MEDOC, mā-dŏk, a wine which derives its name from a district of France, in the ancient province of Gascony. The modern locality is termed Charente-Inférieure; it is mostly covered with vineyards, which are cultivated with great care, and the wines produced from which have a high reputation. They are dry, still and delicate, resembling Bordeaux wines, which territory is immediately south of Medoc. See WINE AND WINE-MAKING.

MEDULLA, *in botany,* the pith of a plant-stem. See PITH.

MEDULLA OBLONGATA, the brain-stem, or that part of the nervous system that lies between the *pons,* or *pons Varolii,* at the upper end, and the spinal cord proper, with which it is continuous, at its lower end. It is a very old part of the nervous system, judged from the standpoint of evolution, and in it are located the important centres of most of the cranial nerves, including the centres that govern the nerves of the heart and of respiration. It

is a triangular cone-like portion of the nerve-axis, about an inch in length and one-half to three-quarters of an inch thick, being tubular below and flattened above. Below, it closely resembles the cervical cord in its internal construction, but above great changes take place to accommodate important new structures. One of the most conspicuous features of the medulla consists in a triangular enlargement of the central canal of the cerebro-spinal axis, constituting what is known as the fourth ventricle. The lower seven cranial nerves have their apparent origin in the medulla, and the first spinal nerve also originates in the medulla proper. The internal anatomy of the medulla is complicated. At the lower end the chief motor tracts, the pyramidal tracts that come from the motor area (q.v.) in the brain cross one another to pass down on opposite sides of the spinal cord. It is because of this decussation that a hemorrhage of the brain of the right side causes a paralysis of the muscles of the left side of the body, and *vice versa*. Just above the decussation of the pyramids the end-stations (nuclei) of the two chief sensory tracts of the body are located. It is into these nuclei — the gracilis and the cuneatus — that all of the sense-impressions from the body below the head are collected, to be passed to higher cerebral centres through the lemniscus or sensory fillet. The chief gray masses in this part of the brain are the nuclei of the cranial nerves referred to, and of the olives, two structures of undetermined function. The best description of the oblongata at present is that of the model of the medulla and pons by Dr. Florence Sabin, which is figured in Barker's 'Nervous System.' Consult also Buck, 'Reference Handbook of the Medical Sciences,' article "Brain," and Johns Hopkins Hospital Reports, Welch Memorial Volume. See BRAIN.

MEDUM, Egypt, village on the Nile, 40 miles south of Cairo, near the Pyramid of Snefru. See PYRAMID.

MEDUSA, mẹ-doo'sạ. See GORGO.

MEDUSA, a disk-bearing jellyfish (q.v.).

MEDWAY, England, a river which rises in the county of Sussex and flows northeast in a winding course across Kent, past Tunbridge and Maidstone, to Rochester and Chatham. Below Chatham it spreads out into a broad tidal estuary, in which are several islets, and joins the Thames at Sheerness. It is 70 miles long and is navigable to Penshurst, 20 miles above Chatham.

MEEHAN, mē'ạn, **Thomas,** American botanist: b. Potter's Bar, near London, England, 21 March 1826; d. Philadelphia, 19 Nov. 1901. From his father, a gardener, he learned facts of natural history when a child; at eight made and recorded an original discovery in herpetology; taught himself from books read at night after daily tasks; at 12 began to publish scientific papers; soon after produced the first hybrid fuchsia; and was nominated to membership in the Royal Wernerian Society. For two years he held a position at Kew Gardens. In 1848 he came to America and took charge of Bartram's Gardens in Philadelphia. In 1854 he established the Germantown Nurseries, which he conducted until the end of his life. For 30 years (1859-89) he edited the *Gardeners' Monthly,* and contributed papers to many other periodicals and to scientific societies. For 23 years he was senior vice-president of the Philadelphia Academy of Natural Sciences, in whose proceedings were published his important 'Contributions to the Life History of Plants.' In 1875 he was elected a fellow of the American Academy for the Advancement of Science, before which, among other noteworthy papers, he read 'A Contribution to the Doctrine of Evolution and the Theory of Natural Selection,' which showed him as a coworker with Darwin and other evolutionary scientists, in whose field he also was a discoverer. From the creation of the office until his death he served as State botanist of Pennsylvania, at one time was a member of the board of visitors of Harvard, and was one of the American editors of the 'Encyclopædia Britannica.' His travels and researches extended throughout the country, including Alaska. In 1878 he began the publication of 'Native Flowers and Ferns of the United States,' an illustrated serial covering a wide field of floral distribution, the main features of which he continued in *Meehan's Monthly,* founded in 1891. Many learned societies abroad enrolled him, and he held intimate relations with nearly all the leading scientists of his time. Among his closest friends was the Comte de Paris, a devotee of plant-study. Meehan was the third American to receive the Veitch medal, awarded to him for "distinguished services in botany and horticulture." Apart from scientific work he devoted himself to public labors; was a member of the Philadelphia common councils from 1882 until his death; during the same period served on the local school board; in both capacities introduced many reforms; and chiefly through his efforts nearly 30 small parks were added to the city. A work of permanent value is his 'American Hand-book of Ornamental Trees' (1853).

MEEK, mēk, **Alexander Beaufort,** American jurist: b. Columbia, S. C., 17 July 1814; d. Columbus, Miss., 30 Nov. 1865. He was graduated from the University of Alabama in 1833 and admitted to the bar two years after. He served in the Seminole War 1836; was attorney-general of Alabama 1836; judge of Tuscaloosa County 1842–44; and member of the legislature in 1853. While there he established the free-school system of Alabama. In addition to a legal digest (1842) he wrote: 'The Red Eagle' (1855); 'Songs and Poems of the South' (1857); 'Romantic Passages in Southwestern History' (1857), etc. His best-known poem is 'The Charge at Balaklava.'

MEEK, Fielding Bradford, American palæontologist: b. Madison, Ind., 10 Dec. 1817; d. Washington, D. C., 28 Dec. 1876. His educational advantages were limited, but his interest in natural history made study imperative to him, and in 1848 he became assistant to David D. Owen in a geological survey of Iowa, Minnesota and Wisconsin. He assisted James Hall at Albany in 1852–58, spending several summers in a geological survey of Missouri and Nebraska, and in 1858 went to Washington, where he devoted the remainder of his life to palæontologic investigations under the government. He was elected in 1870 to the National Academy of Sciences, and was a member of

other scientific organizations. Among his writings are 'Check List of the Invertebrate Fossils of North America' (1864); 'Report on Invertebrate Cretaceous and Tertiary Fossils' (1876), etc. For a complete list of his works, see bibliography published by the Smithsonian Institution.

MEEKER, Royal, American statistician: b. Silver Lake, Susquehanna County, Pa., 23 Feb. 1873. In 1898 he was graduated at Iowa State College and in 1906 took the degree of D.Ph. at Columbia University. He also studied at Leipzig. In 1904–05 he was professor of history, politics and economics at Ursinus College, Collegeville, Pa. In 1905 he became preceptor at Princeton and from 1908 to 1913 was assistant professor of political economy there. On 12 Aug. 1913 Dr. Meeker was appointed commissioner of labor statistics by President Wilson. In 1918 he was appointed member of the United States meat commission. He published 'History and Theory of Shipping Subsidies' (1905).

MEEKINS, mē'kinz, **Lynn Roby,** American journalist: b. Salem, Md., 14 Nov. 1862. He was graduated from Western Maryland College, Westminster, Md., in 1882, and devoted himself to journalism. He was literary editor of the Baltimore *American* 1882–89, when he became managing editor of the Philadelphia *Saturday Evening Post,* and since 1903 has been editor of the Baltimore *Herald.* He has published 'The Robb's Island Wreck' (1894); 'Adam Rush' (1902), etc.

MEERANE, Saxony, town, 10 miles north of Zwickau and 36 miles south of Leipzig. It contains a mediæval church. Meerane is one of the largest textile-producing centres of Germany, turning out vast quantities of woolen and mixed cloths. It has also extensive dyeing establishments, machine works, tanneries, boiler works, motor factories, button, paper box and cement works. The town has a Realschule, a textile school and a school of commerce. Pop. 26,005. Consult Leopold, 'Chronik und Beschreibung der Fabrik-und Handelstadt Meerane' (1863).

MEERKAT. See SURICATE.

MEERSCHAUM (Sepiolite), mēr'shâm or -shum, a name given to one of the silicates of magnesium; it is a mineral of a whitish or creamy color, and received its name from its appearance and the position in which it is sometimes found suggesting that it was petrified foam of the sea. It is obtained from various places, but the best quality comes from Asia Minor, rich deposits of it existing about 20 miles southeast of Eskichehir, at a place called Sepetdje. Here are some 20,000 pits in a space of six miles, of which only 150 are worked, all the others being exhausted. It is said that these mines were opened 1,000 years ago, which is not incredible, as it is well known that magnesia was formerly used for many purposes, other than the fabrication of pipes; moreover, fuller's earth was once worked on a vast scale by the ancients. The meerschaum mines are worked by some 500 miners, who live in the surrounding villages. At Gheikli, in the neighborhood of Sepetdje, there are 3,000 pits, of which only 100 are worked, giving employment to 400 miners. The mineral is mined in blocks, which are taken to Eskichehir, where the blocks are cleaned, the operation consisting of scraping and cutting the blocks with a sharp instrument or knife, the meerschaum being still soft and easily cut into any shape or form. Over 1,100 persons are occupied in cleaning and shaping these blocks, which, after being thoroughly cleaned, are separated into four classes, according to size and quality. These blocks being ready for sale, a bargain is struck between the pipe manufacturers and the commission agents and merchants at Eskichehir, of whom there are about a dozen. The latter then pack the blocks of these four classes with very great care into boxes of equal size, each block being wrapped in cotton to avoid any friction or shock between the pieces. The actual annual output of these mines varies from 120 to 150 tons. It is soft when dug up, but becomes hard when dry. Most of it is sent to Vienna, where it is chiefly made into tobacco-pipes, many of them highly artistic. Similar pipes are also made in Paris, London and elsewhere.

MEERUT, India, the capital of the district and division of the same name, in the United Provinces, situated 40 miles northeast of Delhi on the Northwestern Railway. The city is irregularly built, with narrow, filthy streets. It contains several mosques, a fine town hall, a college, normal school and church schools. At Meerut is one of the largest cantonments in India. Flour and soap are the principal manufactures. The first outbreak of the Indian Mutiny of 1857 occurred at Meerut. The city has a good water supply and an excellent drainage system. Pop. 116,227.

MEES, Arthur, American musical director: b. Columbus, Ohio, 13 Feb. 1850. He was graduated from Concordia College, Fort Wayne, Ind., and studied music in Berlin. He has been assistant director, and later director, of some of the leading operas and musical associations, and has published, in addition to his annotated programs for the New York Philharmonic Society and the Chicago Orchestra, 'Chorus and Choral Music.'

MEGACLES. The most illustrious Greek of this name was the head of the family of the Alcmæonidæ at Athens in the time of Solon. After twice expelling Pisistratus, who in 560 B.C., had made himself "Tyrant" of Athens, he was himself exiled by the latter together with all his family.

MEGALENSIA, or MEGALESIA, an annual festival at Rome (4–10 April) in connection with the foreign cult of Cybele, the *Magna Mater* or Great Mother of the Gods, celebrated by a procession of her eunuch-priests, by circensian and theatrical shows, and at the close a carnival.

MEGALITHIC MONUMENTS. See DOLMEN; MENHIR; STONES, STANDING; STONE CIRCLES.

MEGALONYX. See GROUND-SLOTHS.

MEGALOPOLIS, mĕg-ą-lŏp'ō-lĭs, **or SINANON,** Greece, a ruined city on the ancient Helisson, in the nomarchy of Gortynia, 5 miles north of Leondari. It was founded 370 B.C. by Epaminondas (q.v.) as the federal capital of Arcadia and was a magnificent walled city, five and one-half miles in circumference; it was frequently but unsuccessfully attacked by the

Spartans. In 222 B.C. it was captured and partially destroyed by Cleomenes III. From 1890–93 the British School at Athens excavated the site and revealed the Precinct of Zeus Soter, the Agora, the Stoa of Philip and the Stoa of Myropolis on the right bank of the river, and on the left bank, the hemispherical Theatre 400 feet in diameter, and the Scanotheca, the Thersileon or great assembly hall, altars and remains of other buildings described by Pausanias. Consult Schultz and Loring, 'Excavations at Megalopolis' (1892); Haigh, A. E., 'The Attic Theatre' (Oxford 1907).

MEGALOSAURUS, mĕg″ą-lō-sâ′rús, a genus of huge carnivorous dinosaurs of the group *Theropoda.* Their remains occur frequently in the European oölitic rocks. The extreme length was about 50 feet. They were covered with scales and built like lizards, but with proportionally longer, heavier legs. See DINOSAURIA.

MEGAPHONE (a Greek word meaning "great sound"), an instrument magnifying the sound of the voice many times, so that one can be heard at a considerable distance. In its simplest form it is a cone-shaped trumpet, and the speaker shouts into the small end, the instrument directing the sound waves wherever it is aimed. This form is used by announcers at base ball games, etc. The form invented by Thomas A. Edison consists of two large funnel-shaped receivers in which the waves of sound are collected and concentrated and carried by means of flexible tubes held to the ears of the person using the instrument. In the instrument called telephone-megaphone, the mouthpiece of the telephone is connected with four transmitters which multiply the usual telephone sound of the voice by four, and it is sent by wire, so increased, into the megaphone, which sends it forth into space with sufficient intensity to carry it with perfect distinctness throughout a large church or hall. One form of megaphone is largely used by deaf persons.

MEGAPODES, a general name for the brush-turkeys or mound-birds of Australia constituting the gallinaceous family *Megapodiidæ,* so named in reference to the disproportionately large size of the feet; and remarkable for their breeding habits. The family, although mainly Australian, is represented in many of the South Sea Islands and in the Philippines, replacing the pheasants, which are absent from that region. There are 7 genera and 20 or more species, mostly with restricted individual ranges, and varying in size from that of a turkey to that of a large pigeon, the sexes being always alike in plumage. The general colors are browns and yellows with the naked wattled parts brightly colored. They have a short, strong bill; the head and neck almost naked and wattled; the wings short and round, the tail large; the legs and feet large, strong and provided with great claws. Megapodes are terrestrial birds found in hill-valleys, among thickets or along river and sea beaches. They run well, but if hard pressed will take to trees where they hop about awkwardly; their flight is heavy, but may be long sustained. Hoarse, chuckling, cackling or mewing cries express the utterances of the different species, which are often heard at night. The food consists of fallen fruit, seeds, berries, worms, snails, insects and even small crabs. The flesh is dark-colored and not good, though palatable to the Australian aborigines.

One of the best known species is the brush-turkey or mound-turkey (*Catheturus lathami*), also known as the wattled talegalla and the New Holland vulture, the latter name being given to it on account of its yellow, naked head and neck, covered in part with fleshy wattles. It is rather common in New South Wales, inhabiting the most thickly wooded parts. It is a large bird, about the size of a turkey, with blackish-brown plumage. It is shy, and when pursued, endeavors to escape by running through the thickest brush, or by leaping to the lowest branches of a tree, and thus avoids the dingoes or native dogs, which, however, often hunt it down on open ground. It is easy game to the sportsman, who finds it roosting under shelter of the branches of trees during the heat of the day, and although several of a flock are shot, the rest keep their place undisturbed. They are generally seen in small flocks, and make their nests together, the females heaping up, by means of their feet, mounds of several cartloads of earth and decayed leaves, which are used from year to year, new materials being added every year. The eggs are separately buried, often by several females, within the mass, where they are hatched by the heat of the fermenting mound. The parent birds partially uncover them during the day. Nearly a bushel of eggs may sometimes be found in a single heap. The male bird pays great attention to the young after they are hatched, covering them up partially in the mound at night for warmth. The flesh of the talegalla is excellent, and the eggs are also very delicate and eagerly sought after. Two other species occur in New Guinea.

South and West Australia have another familiar megapode in the mallee-hen or "native pheasant" (*Lipoa occellata*)—a large gray-brown bird with eye-like markings on the wings and back, and the naked neck and wattles blue; its mounds are comparatively small and often made individually. A bird often confounded with this in books because of similarity of name is the maleo (*Megacepalon maleo*) of North Celebes, which has the singular habit of making a general migration in the breeding season to the sea-beach, where small groups of females dig large holes in the sand just above high-water mark, and day by day bury eggs there until the quota of each is laid; these gradually hatch under the influence of the hot sand. The largest genus is *Megapodius,* whose 15 species are scattered over all the island region between Samoa, the Philippines and the Micobars, each group having a distinct species. The most widely distributed and best known is *M. tumulus,* the common mound-bird or scrub-turkey of Northern Australia and the Papuan archipelago, which fashions mounds 10 or 11 feet high in the densest woods, continues to use them year after year, and lays pale, coffee-colored, thin-shelled eggs in straight burrows penetrating the mound. In some islands the eggs of these birds are an important food resource. The young are well fledged when they emerge from the egg and scramble out of the mound, but are attended to by their parents for some time. Consult Newton, 'Dictionary of

Birds' (1869); 'Proceedings,' Zoological Society of London, 1876, 1888, etc., and works on the ornithology of Australia and Oceanica.

MEGAPOLENSIS, Joannes, Dutch Protestant missionary to the North American Indians: b. Koedyck, Holland, 1603; d. New York, 24 Jan. 1670. His family name, van Mekelenburg, he Hellenized to Megapolensis. In 1642 Van Rensselaer, the first Patroon, brought him to New York from Holland, and he soon learned the Mohawk tongue and preached successfully among the Indians near Albany, several years before John Eliot's mission or any other Protestant preaching to the Indians. From 1649 until his death he was pastor of the Dutch church in New York, where he showed little tolerance to Lutherans and Independents. He advised peaceable surrender to the English in 1664. His account of the Mohawks is published in the third volume of the New York Historical Society's 'Collections' (1870).

MEGARA, Greece, the capital of ancient Megaris (q.v.), between Attica and Corinth; also a modern town in the eparchy of Megaris, of 6,500 population.

MEGARION SCHOOL OF PHILOSOPHY, a Greek school of philosophy based on and developed from a part of the Socratic system. Euclid of Megara was the first to give definite form to its teaching. Eubulius was also a prominent member of this school, which confined itself mainly to dialectic methods, and sought to unite the Socratic ethical principle and the Eleatic theory of the One, to whom only true being might be attributed.

MEGARIS, mĕg'ą-rĭs, Greece, the name of an ancient state or small district bounded north by Bœotia, east by Attica, south by the Saronic Gulf and the territory of Corinth, west by the Corinthian territory and the Corinthian Gulf; area, about 143 square miles. It is a mountainous country, the only plain being that on which the capital was situated. Mount Cithæron was on the north boundary, separating it from Bœotia. The people were traders and sold their textiles over a large area. The only important town was Megara, situated a mile from the sea, opposite the island of Salamis. It contained a Pelasgian citadel, called Caria, on a hill northwest of the city, with a temple to Demeter called Megaron, from which the name of the town is supposed to be derived. It had flourishing colonies at an early period, and its navy was so powerful that it was only after a long struggle with it that Athens obtained possession of Salamis. It afterward became annexed to Attica, of which Megaris formed one of the four ancient divisions. It was successively conquered by the Dorians and the Corinthians, but afterward asserted its independence, and became wealthy and powerful.

MEGASTHENES, a Greek historian, who about the year 300 B.C., as ambassador of King Seleucus Nicator at the court of the Indian king Sandracottos, gathered the material for a geographical and historical account of India that, reaching us in the form of fragments and worked over in Strabo, Diodorus and Arrian, is our chief source of knowledge of that country in antiquity. There is an edition of the fragments by E. A. Schwanbeck (Bonn 1846); also a translation by McCrindle, 'Ancient India as Described by Megasthenes and Arrian' (Calcutta 1877).

MEGATHERIUM, a gigantic fossil ground-sloth, the largest known edentate, representing the family *Megatheriidæ*, and especially the species *Megatherium americanum*, whose remains are found plentifully in the Pleistocene strata of Argentina and Patagonia. These early edentates were so generalized, that, as compared with modern forms, they exhibit the head and teeth of a sloth, associated with the vertebræ limbs and tail of the ant-eater. Some of them attain a gigantic size, at least as large as an elephant, but with shorter limbs and a bigger tail, and the latest species are the most bulky. *Megatherium*, according to Woodward, seems to have been entirely destitute of dermal armor. The only one of its allies in which bony plates have been discovered is *Mylodon*, and they are very small and not fused together. The pelvis and hind limbs are heavily formed, showing that the animal was in the habit of standing on them, steadied by the powerful tail, like a kangaroo. They fed on the branches of trees. The mylodons were somewhat smaller than the megatheria, with a skull and teeth more like those of the modern sloths, and the three inner digits of the forefoot bear claws, about equal in size, instead of the huge middle-finger claw of the Megatherium. In both animals the hind foot lacks digit I, but II and III bear claws. The typical species of mylodon (*M. harlani*) was about as large and of much the same form as a rhinoceros, and inhabited the southwestern United States, while various other species lived in South America. The long-headed South American genera, *Scelidotherium* and *Megalonyx*, are other forms of the same family. See GROUND-SLOTHS. Consult the palæontological writings of Leidy, Lydekker and Woodward, also Scott, G. B., 'History of Land Mammals' (1913).

MEGIDDO, an important fortress city of ancient Canaan. Thothmes III captured it in the 23d year of his reign, and took therefrom magnificent spoils. The city is mentioned several times in the Tel-el-Amarna correspondence. Though nominally in the territory of Manasseh (Jos. xvii, 12, 13; Judg. i, 27, 28) it remained in possession of the Canaanites. Near the "waters of Megiddo" Barak and Deborah defeated the Canaanites under Sisera (Judges v, 19–21). Solomon restored the fortifications (1 Kings ix, 15) and Ahaziah is said to have died there (2 Kings ix, 27). Finally it was at Armageddon (*Har-Megedon*, mountains of Megiddo) that the great conflict of Revelations xvi, 16, was to take place. The site of Megiddo may now be considered as proved to be Tel-el-Mutesellim, a great mound four miles northwest of Tel Taanach. It was evidently of great strategic importance since it commanded the pass from the Plains of Sharon to the Plain of Esdraelon, which in all the centuries from Thothmes III to Allenby in 1917–18 has been the route of armies. Fortifications preceding 2000 B.C. have been uncovered on the site, together with the remains of several cities which rose here successively and vanished. Here too was found the seal of Shama, servant of Jeroboam (II?). In Roman times the place was a fortified post — the *Legio* of

Eusebius, the modern *el Lejjun*. Consult Schumacher, 'Tell el Mutesellim: Bericht über die 1903 bis 1905 veranstalteten Ausgrabungen I' (Leipzig 1908).

MEGNA, měg'nạ, or **MEGHNA**, India, the estuarine outlet of the Ganges and Brahmaputra (qq.v.), in Bengal. There are four principal mouths, producing three islands. The tidal bore is characterized by its velocity, which endangers navigation, advancing at the rate of 15 miles an hour, and frequently attaining a height of nearly 20 feet. As the bottom is loose sand; it shifts continually, making navigation difficult.

MEGRIM. See MIGRAINE.

MEHEMET (mā'hĕ-met), or **MOHAMMED** (mō-ham'ĕd), **ALI**, viceroy of Egypt: b. Kavala, Macedonia, 1769; d. Cairo, 2 Aug. 1849. An orphan, he was brought up by a janizary captain, governor of Kavala, who married him to a kinswoman and made him a militia officer. When the French invaded Egypt he was sent there, rose rapidly, became the confidant of Koshrew, pasha of Egypt, and, by treachery both to the pashas and the Mamelukes and by a liberal use of his wealth, in July 1805 became pasha of Cairo, whence his power quickly spread over the rest of Egypt. His utterly unscrupulous policy was shown by his massacre of nearly 1,700 Mamelukes in 1811. He extended the limits of Egypt by wars on the Arabian Wahabees, by the possession of Nubia and Kordofan, and by the treacherous conquest of Syria, in which he aimed at independence of the Porte. This first break with Turkey was settled by the Powers; and in 1839 the Sultan was forced to call on the Powers to help him turn Mehemet out of Syria: by the treaty then concluded he surrendered Syria, Candia and Hejaz: but was made hereditary pasha. His internal administration was vigorous; both agriculture and manufactures flourished, thanks to French capital solicited by Mehemet, who also introduced European methods into his army, and established a system of education. He was insane during the latter part of his life, and was succeeded by his grandson; his son, who took his place as regent in September 1848, died in November of that year. Consult Murray, C. A., 'Memoir of Mehemet Ali' (London 1898).

MEHRING, Franz, German historian, critic and socialist philosopher: b. Schlawe, Pomerania, 27 Feb. 1846; d. Berlin, 29 Jan. 1919. He was of middle-class Pomeranian origin, but became interested early in life in the struggles of the poor. His life is an interesting example of the career of a political thinker who passes out of the organizations of his own class and into those of the lower classes, by natural sympathy, although in Mehring's case this process took a long time. He attended the University of Berlin, where he obtained the Ph.D. degree, simultaneously working for a democratic newspaper, *Zukunft*, under the direction of Johann Jacoby and Dr. Guido Weiss. After this paper was suppressed (1871), he became a member of the staff of *Die Wage*, a weekly edited by Dr. Weiss. In 1873 appeared Mehring's first socialistic pamphlet, "Herr von Treitschke, der Sozialistentöter, und die Enziele des Liberalismus," which, as its title indicates, is an attack upon Treitschke (q.v.). When the two chief socialistic bodies in Germany united at Gotha in 1875, Mehring was sympathetic to the new party but did not become a member, and a rather personal controversy which he had with Leopold Sonnemann, editor of the *Frankfurter Zeitung*, for which Mehring had been Berlin correspondent, removed him more and more from the activities of the Social-Democratic party. From 1877 to 1882, Mehring was unfavorably disposed toward the leaders of the party, and in his 'Geschichte der deutschen Sozialdemokratie,' which he began writing in those years, he made many attacks upon them, for which he was seriously taken to task at the Dresden Party Congress. He defended himself in a little book 'Meine Rechtfertigung' ('My Justification'), in which he asks forgiveness for having been so foolish as to believe that the monarchic régime might develop into an honest democratic republic, which idea, he explains, has been completely corrected by the anti-socialistic laws as administered by the Prussian government. Yet Mehring still hoped that it might be possible to found a bourgeois democratic party in Germany, in which work, which was foredoomed to failure, he was associated with Lenzmann (1884). He was editor-in-chief of the *Berliner Volkszeitung* (1885–89), but was forced to resign from that paper because of a controversy with Paul Lindau (q.v.), arising out of the latter's maltreatment of the actress Elsa von Schabelski (by a curious coincidence, Paul Lindau's death in January 1919, coincided almost to a day with that of Mehring). Mehring has written profound historical analyses, among which the best are 'Die Lessing-Legende' (1893) and 'Gustavus Adolphus' (1894). As a man of 70 his hostility to the German Imperial government was still unbroken, and together with Rosa Luxemburg and Karl Liebknecht he wrote, in January 1915, a pamphlet attacking the militaristic system that had plunged Europe into war, known as the "Junius" pamphlet. This appeared in Switzerland and was secretly circulated in Germany (English translation: 'The Crisis in the German Social-Democracy,' New York 1918). He spent considerable parts of 1916 and 1917 in jail, under "preventive detention," but had to be released because of his failing health. In January 1918 he was elected a member of the Prussian Landtag, on the socialist ticket, and distinguished himself in that body by his biting comments on the inability of the Prussian military leaders; Mehring had always had a sort of amateur interest in military affairs; a number of his pamphlets deal ably with questions of this kind. Shortly before (September 1918) the final defeat of the German armies (October) on the western front, Mehring predicted that the hope of the militarists in the inability of the United States to land sufficient troops in Europe would be disappointed. His death was due to pneumonia, and coming, as it did, close upon the murder of Liebknecht and Rosa Luxemburg (15 Jan. 1919), it considerably depressed the hopes of the radical element ("The Reds") of the German Social-Democracy. Of the four chief leaders of the so-called "Spartacus" group, three had therefore met death in one month, and only one, Klara Zetkin (q.v.), an old woman, herself seriously ill, was still alive

in April 1919. Consult also *Die Neue Zeit* (1882 et sequitur, Stuttgart); *The Class Struggle* (New York 1917 et sequitur).

JACOB WITTMER HARTMANN.

MÉHUL, Etienne Henri, ā-tē-ĕn ŏn-rē mā-ül, French musical composer: b. Givet (Ardennes), 22 June 1763; d. Paris, 18 Oct. 1817. For some years he substituted the name Nicholas for Henri. He studied at Paris under Gluck; and after the departure of the latter for Vienna, Méhul presented to the Royal Academy of Music the opera of 'Cora and Alonzo,' the representation of which was delayed for six years. He then turned to the Opéra Comique, which gladly received his 'Euphrosine and Coradin' in 1790. His patriotic hymns, 'Chant du Départ,' 'Chant de Victoire,' and 'Chant Retour,' greatly increased his fame. He was chosen a member of the Institute in 1796, of the Academy of Fine Arts in 1816, and a knight of the Legion of Honor in 1802. His chief operatic work is 'Joseph' (1807). His style as a composer is remarkable for dramatic force and coloring. There is a 'Life' by Pougin (1889). His statue was erected in his native town in 1892.

MEIBOMIA, a genus of erect perennial herbs of the pea family, of which about 150 species are natives of warm and temperate America, Africa and Australia. More than 40 species belong to the United States, some of the more familiar of which are called "tick-seeds."

MEIDERICH, Prussia, town of the Rhine province, 15 miles northeast of Krefeld. It contains several large iron and steel mills, machine shops, brickyards, phosphate works and saw mills. Coal deposits are worked in the vicinity and there is a large cattle trade. Its history as an industrial centre began in 1850. It was annexed to Duisburg in 1905. Pop. 40,000. Consult Graeber, 'Tausendjährige Geschichte von Meiderich' (1893).

MEIER, Edward Daniel, American mechanical engineer: b. Saint Louis, Mo., 1841; d. 1914. In 1858 he was graduated at Washington University and subsequently studied four years at the Royal Polytechnic College at Hanover, Germany. In 1863 he enlisted in the 32d Pennsylvania Volunteers; served later in the artillery and in the engineers and was a cavalry lieutenant at the close of the war. He entered locomotive works at Paterson, N. J., after the war, became superintendent of machinery of the Kansas Pacific Railroad in 1867; chief engineer of the Illinois Coke Company in 1870; and two years later constructing engineer of the Meier Iron Company. He founded the Heine Safety Boiler Company of St. Louis in 1884, of which he was president in 1914. For many years Mr. Meier was president of the American Diesel Engine Company. In 1908–14 he was president of the American Association of Boiler Manufacturers and of the Machinery and Metal Trades Association. In 1911 he was president of the American Society of Mechanical Engineers.

MEIGGS, mĕgz, **Henry,** American contractor: b. Catskill, N. Y., 7 July 1811; d. Lima, Peru, September 1877. He was engaged in the lumber business in New York and other places but met with financial reverses and in 1848 went to California, where he again took to the lumber business and gained an immense fortune. Reverses, however, once more swept away his wealth, leaving him with an indebtedness of more than $1,000,000. He fled with his family to Peru, where he soon embarked upon a series of bridge- and railway-building enterprises which won for him immense wealth and a world-wide fame as a railway contractor. His engineering achievements in South America comprise some of the most daring feats in the history of the profession. The construction of the Callao, Lima and Oroya road, which crosses the Andes and ascends to a height only 136 feet lower than the summit of Mount Blanc, was his crowning achievement, and was practically completed at his death. He paid in full the enormous obligations incurred by his failure in San Francisco, contributed generously to charities in the United States and Peru, and by the laying out of a beautiful park, which he presented to the city of Lima, materially changed for the better the appearance of the city.

MEIGS, Charles Delucena, American physician: b. Saint George, Bermuda, 1792; d. 1869. In 1809 he was graduated at the University of Georgia, and in 1817 at the medical college of the University of Pennsylvania. In the same year he established his practice in Philadelphia and became prominent as an obstetrician. He was professor of obstetrics and diseases of women and children at the Jefferson Medical College from 1841 to 1861. He was one of the first editors of the *North American Medical and Surgical Journal,* which he helped to found in 1826. Dr. Meigs published 'The Philadelphia Practice of Midwifery' (1838; 2d ed., 1842); 'Lectures on Some of the Distinctive Characteristics of the Female' (1847); 'Females and their Diseases' (1848; 2d ed. with title 'Woman; Her Diseases and Remedies,' 1851; 3d ed., 1854); 'Remarks on Spasmodic Cholera' (1849); 'Obstetrics' (1849; 3d ed., 1856); 'Observations on Certain Diseases of Children' (1850); 'Treatise on Acute and Chronic Diseases of the Neck of the Uterus' (1854); 'On the Nature, Signs and Treatment of Childbed Fevers' (1854); translations of Hufeland's 'Treatise on the Scrofulous Disease' (1829); Velpeau's 'Elementary Treatise on Midwifery' (1831); Colombat de L'Isère's 'Treatise on the Diseases and Special Hygiene of Females' (1845). Consult Meigs, John F. 'Memoir of Charles D. Meigs' (Philadelphia 1872).

MEIGS, Montgomery, American civil engineer: b. Detroit, Mich., 27 Feb. 1847. He was educated at Harvard and in Germany, and was for several years in the employ of the Northern Pacific Railroad. Since 1882 he has had charge of the Des Moines Rapids Canal under the government. He is the inventor of a "canvas coffer-dam." He also constructed the United States dry dock at Keokuk. In 1898 he proposed a new method of improving country roads by using oil with a sprinkler to make a water-tight surface and lay dust, which attracted wide attention and has since been generally adopted. He built and designed many steamboats and steam dredge tenders for the United States. In 1910–13 he was the government local inspecting engineer in the construction of the great lock, dry dock and power developments in the Mississippi River at Keokuk, Iowa.

MEIGS, Montgomery Cunningham, American military officer: b. Augusta, Ga., 3 May 1816; d. Washington, D. C., 2 Jan. 1892. He was graduated from West Point in 1836 and entering the engineering corps the next year was engaged in the construction of forts Delaware, Wayne, Porter, Niagara, Ontario and Montgomery until 1852, when he took charge of the building of the great Potomac aqueduct. In 1860 he built Fort Pickens in Florida, and in 1861 was appointed quartermaster-general of the United States army and given rank as brigadier-general. He was promoted major-general in 1864, and in 1875–76 he was sent by the government to Europe to make an inspection of various staff-departments, the quartermaster's in particular. After his retirement in 1882 he was engaged in preparing plans for various public buildings in Washington. He was a regent of the Smithsonian Institution and of many scientific societies, and was at his death architect of the Pension building.

MEIGS, Return Jonathan, American soldier and pioneer: b. Middletown, Conn., December 1734; d. at the Cherokee agency, Ga., 28 Jan. 1823. At the commencement of the Revolutionary War he raised a company of men and marched to the American camp at Cambridge, subsequently accompanied Arnold on his expedition against Quebec, where he was taken prisoner, and after his release was commissioned a colonel in the Continental army. He signalized himself by a brilliant expedition against a British post at Sag Harbor on Long Island, for which he received the thanks of Congress and a sword, and took a distinguished part in the capture of Stony Point under General Wayne, and elsewhere in the course of the war. In 1788 he emigrated to Ohio, and established himself at Marietta. In 1801 he was appointed by President Jefferson Indian agent of the Cherokees, among whom he passed the remainder of his life.

MEIGS, Return Jonathan, American soldier and politician, son of the preceding: b. Middletown, Conn., November 1765; d. 29 March 1824. He was graduated from Yale in 1788, went to Marietta, Ohio, with his father in 1788 and rose to prominence there as a lawyer. He was chief justice of the Ohio supreme court 1803–04; served in the army as a brevet colonel 1804–06; was a judge in Louisiana 1805–06; and in Michigan for the two years following. After being senator from Ohio 1808–10 he was governor of that State for the next four years, in which period he was an active supporter of the war measures of 1812–14. He was postmaster-general of the United States 1814–23.

MEIGS, William Montgomery, American lawyer and biographer: b. Philadelphia, 12 Aug. 1852. He was graduated from the University of Pennsylvania in 1872, studied law and was admitted to the bar in 1879. In addition to his law practice he has devoted much time to literary work and is author of 'Life of Joseph Meigs' (1887); 'Life of Charles Jared Ingersoll' (1897); 'The Growth of the Constitution' (1900); 'The Life of Thomas Hart Benton' (1904), etc.

MEIJI, may-ee-jee, the name of the most famous era in the history of Japan (1868–1912). From the introduction of almanacs and chronology from China, 645 A.D., it has been customary to select a nengo, or year-period, from certain words, mostly of happy augury, contained in the Chinese cycle of 60 years (a "cycle of Cathay"). The two words united in Meiji mean Enlightened Government. Of old, it was customary to change the nengo for arbitrary reasons, but from 1868 the rule was fixed to have each year-period begin and end with the emperor's reign. Succeeding the Meiji era, in 1912, was that of Tai-sho, or Great Righteousness. All the dates in Japanese historical records, before 1868, are given in year-periods and the months and days according to the lunar calendar. In 1880, Mr. William Bransen, in Tokio, after elaborate investigation, published his great work, which enables one to express all the Japanese dates, of the 243 year-periods, from 645 A.D., in terms of the Gregorian or European calendar, which in 1875 was adopted in Japan. Consult Clement, 'Handbook of Modern Japan' (1913), and Bransen, 'Japanese Chronological Tables' (Tokio 1880).

MEIKLEJOHN, mī'k'l-jŏn, **Alexander,** American educator: b. Rochdale, England, 3 Feb. 1872. He came to America in 1880; was graduated from Brown University in 1893 and from Cornell in 1897. In 1897–99 he was instructor in philosophy at Brown University; was associate professor 1899–1903. In 1906–12 he was professor of logic and metaphysics there, and in the latter year was called to Amherst as president and professor of logic and metaphysics.

MEIKLEJOHN, mī'k'l-jŏn, George D., American lawyer: b. Weyanwega, Wis., 22 Aug. 1857. He was graduated from the University of Michigan in 1880 and established himself in a law practice at Fullerton, Neb., in that year. He held several public offices and in 1884 and 1886 was elected State senator. In 1889 he was elected lieutenant-governor of Nebraska and in 1893–97 served as member of Congress. He was appointed Assistant Secretary of War in 1897 and filled that post through the war with Spain, retaining his office after the resignation of Secretary Alger, until 1901, since which time he has been engaged in his law practice at Fullerton.

MEILHAC, Henri, ŏn-rē mā-yăk, French playwright: b. Paris, 25 Feb. 1831; d. there, 6 July 1897. His work as a dramatist, begun in 1855, was attended at first by scant success, but he finally became a favorite playwright. Much of his work was done with Halévy (q.v.). He furnished the book for Offenbach's 'Grande Duchesse,' 'La Périchole,' and 'Les Brigands,' and other works of that composer. Among his independent plays are 'Petite Marquise' and 'Décoré.' In 1888 he was elected to the Académie Française.

MEILLEUR, Jean Baptiste, Canadian author and educator: b. Saint Laurent, near Montreal, 1795; d. 1878. He received his education at the Collège Saint Sulpice de Montreal; studied for the bar, but later took up the study of medicine at the Carleton Medical College, Vermont, where he was graduated in 1825. He became editorial writer on the *Tessier Journal* and was elected to the Legislative Assembly of Lower Canada in 1834. In 1842 he became superintendent of public instruction and retained this post until 1857. Several educational in-

stitutions were founded during his administration which was eminently successful. Meilleur became postmaster of Montreal in 1862. He was a founder of the Collège de l'Assomption. His published works included textbooks on chemistry, education and grammar, all in French.

MEININGEN, mī'nĭng-ĕn, Germany, the capital of the small Duchy of Saxe-Meiningen, in a narrow, well-wooded valley, on the Werra, 40 miles southeast of Erfurt. It is an attractive modern town with regular and handsome streets, having been practically rebuilt since the disastrous fire in 1874 which destroyed the old town. The principal buildings are the new town-house and the ducal palace with a church, private and public library of 55,000 volumes, picture gallery, museum, etc., attached. The stock company of the local theatre which for 16 years enjoyed a European reputation for the excellence of its acting and staging, was dissolved in 1890. The industries are only of domestic importance and include brewing, woolen and cotton-weaving. Pop. 17,186.

MEISSEN, mī'sĕn, Germany, a town of Saxony, founded by Henry I in 922–33, 14 miles northwest of Dresden, on the left bank of the Elbe, at the confluence of the Meisse and Triebisch. It has a noble old castle originally built in the 10th century and rebuilt in the 15th century on a precipitous rock above the town, recently restored. There is a fine old Gothic cathedral, 500 to 600 years old. Also the Franciscan church, a large and magnificent edifice, used as the custom-house; the church of Our Lady, or city church; the ancient church of Saint Nicholas; and other public buildings. The royal porcelain factory, first established by Bœttcher (q.v.), and now at some distance from the town, is the great industrial establishment of the place; there are also manufactures of matches, stoves, iron foundries and machine-works, a jute-mill, breweries, etc. Meissen is the see of an archbishop. Pop. about 35,865.

MEISSONIER, Jean Louis Ernest, zhŏn loo-ē ĕr-nā mā-sō-nyā, French painter: b. Lyons, France, 21 Feb. 1815; d. Paris, 31 Jan. 1891. He came to Paris in early youth and entered the studio of Cogniet, meanwhile forming his style on the Dutch masters as represented in the Louvre. He first attracted attention by his illustrations of the Bible, Bossuet's 'Universal History,' 'Orlando Furioso,' 'Paul and Virginia,' etc. His earliest paintings in genre to be exhibited in the Salon were 'The Little Messenger' and 'The Chess Player' (1836). His reputation grew rapidly on the successive appearance of 'The Monk' (1838); 'The English Doctor' (1839); 'The Chess Party' (1841). The times of Louis XIV and Louis XV with all the accessory richness and variety of costumes, weapons and domestic luxury, began to find in him their most successful delineator. In the many canvases which he produced in this narrow department of genre he showed a keen and strong, but not too florid, power of characterization, which was accompanied with a marvelous technique in the handling of stuffs, metals, etc. But modern history eventually claimed his attention and he found a congenial field for the exercise of his special gifts in the campaigns of Napoleon. His pictures were often small, but finished with minute and delicate virtuosity, a good example of which may be seen in his 'Cuirassiers of 1805'; but he is perhaps less successful in large canvases and elaborate figure compositions than in his small paintings. Among his most famous pictures of the Napoleonic cycle are 'Napoleon I with his Staff' and 'Napoleon III at Solferino' (1864); 'Napoleon I at Friedland' (1875), now in the Metropolitan Museum of New York. In his latter days he painted Venetian scenery and architectural views with his usual dash, thoroughness and originality. In his works he shows the best qualities of the Dutch school with all its life-like expression, truthfulness and spirit combined with the delicacy of French sentiment and abandon. His water colors, etchings and lithographs bear admirable witness to his versatility and vigorous industry. His pictures have always fetched a high price, 'Friedland or 1807' having been sold for $60,000, a sum scarcely disproportionate to that given for smaller canvases. He is to be looked upon as the founder of the new school of military painters represented by his son Jean Charles Meissonier and Edouard Detaille, his most illustrious pupil. Consult Claretie, 'Meissonier' (1881); Larroumet, 'Meissonier' (1893).

MEISTERMANN, Barnabas Francis Joseph, German archæologist and missionary: b. Pfaffenheim, Alsace, 27 March 1850. He received his education in the seminary of Strassburg and in 1873 was ordained to the priesthood of the Roman Catholic Church. In 1875 he joined the Franciscan Order, was sent to France and England for a time, and from 1887 to 1893 labored as a missionary among the Chinese. Since 1893 he has resided in Jerusalem, engaged in teaching, writing and research work. His works include 'La Portioncule' (1884); 'Le Mont Thabor' (1900); 'La Montagne de la Galilée où le Seigneur apparut aux Apôtres' (1901); 'Deux questions d'archéologie palestinienne' (1902); 'Le prétoire de Pilate et la forteresse Antonia' (1902); 'Questions de topographie palestinienne' (1903); 'Le tombeau de la Sainte Vierge à Jerusalem' (1903); 'La ville de David' (1903); 'La patrie de Saint Jean-Baptiste' (1904); 'New Guide to the Holy Land' (London 1907); 'Guide du Nil au Jourdain par le Sinaï et Pétra' (1909). He contributed to the 'Catholic Encyclopedia.'

MEISTERSINGERS, mīs'tĕr-sing-ĕrz, or **MASTER-SINGERS** (Ger., *Meistersinger*), a society of German singers formed in the 14th century. During the long evenings of winter the worthy burghers of the German cities assembled to read the poems of the minstrels. Some of the hearers were naturally led to try their own skill in verse; others followed, and the spirit of the age soon embodied these votaries of the muse into societies after the fashion of corporations. Charles IV gave them a charter and a coat of arms. They met on certain days and criticized each other's productions, in which external correctness seems to have appeared to them the chief object; few, indeed, had an idea of the difference between poetical and prosaical ideas or expressions. Their attempts in the lyric style were chiefly limited to spiritual songs; in the epic to rhymed versions of the scriptural narratives. They were also

fond of the didactic style. The rules by which the members of the societies were to be guided as to the metre, etc., of their compositions were written on a table, and called *tabulatur*, for the sake of enforcing a strict observance of purity in language and prosody. The chief faults to be avoided were collected; they were 32 in number, and distinguished by particular names. He who invented a new metre, invented also a new tune, the names of which were the drollest and sometimes the most senseless imaginable. Besides their stated meetings they held public meetings, generally on Sundays and festivals in the afternoon in churches. In Nuremberg, where the master-singers flourished particularly, such meetings were opened with free singing, in which anybody might sing, though not belonging to the corporation. In this the choice of the subjects was left comparatively uncontrolled; then followed the chief singing, when only those who belonged to the corporation were allowed to sing, and only on scriptural subjects. The judges were called *Merker*, and sat behind a curtain. There were four: one watched whether the song was according to the text of the Bible, which lay open before him; the second whether the prosody was correct; the third criticized the rhymes; the fourth the tunes. Every fault was marked, and he who had fewest received the prize, a chain with medals. Whoever had won a chain was allowed to take apprentices, to have many of whom was a great honor. Money was never taken from apprentices. After the expiration of his poetical apprenticeship the young poet was admitted to the corporation, and declared a master after having sung for some time with acceptation. These strange societies originated toward the end of the 14th century at Mainz, Strassburg, Augsburg and continued in several free cities of the empire until the 17th, in Nuremberg to the 18th century, where probably the renown of Hans Sachs (q.v.), the famous shoemaker and poet, kept them longer in existence. The last society of the kind was that of Ulm, which was dissolved in 1839. Richard Wagner, in his musical drama, 'Die Meistersinger' satirized the art of these early masters. Consult Mey, K., 'Der Meistergesang in Geschicht und Kunst' (1892); Nagel, W., 'Studien zur Geschicht der Meistersanger' (1909).

MEJERDA, or MEJIRDA, mĕ-yĕr'da, the ancient BAGRADAS, a river of North Africa, formed by the union of several head-streams rising in the Atlas Mountains in Algeria, and flowing through Tunis to its outlet in the Mediterranean, 24 miles north of the city of Tunis. The mass of sediment which it brings down has enlarged its delta and changed the coast line, its mouth formerly being at Bu-Chateur, seven miles southward. Its whole course is about 200 miles.

MEKONG, mā-kŏng', or **CAMBODIA,** a river of Indo-China. See CAMBODIA.

MELA, mē'lä, **Pomponius,** a geographer who flourished during the 1st century of the Christian era, probably under the Emperor Claudius. Little more is known of him than that he was a native of Spain, and the author of a treatise in three books in the Latin language, 'De Situ Orbis,' containing a concise view of the state of the world so far as it was known to the ancient Romans. Mela is edited by Tzschucke (1807), Parthey (1867), and Frick (1880).

MELACONITE. A black copper ore consisting of oxide carrying 79.7 per cent of copper. Occurs in many mines.

MELAMPUS, in Greek mythology, son of Amythaon, who was the first mortal endowed with the gift of prophecy, and who first practised the medical art. He is said to have introduced the worship of Bacchus into Greece. According to the legend, he could converse with animals, and was favored by Apollo, who taught him divination. His powers saved his life when he was imprisoned in Thessaly. The worms in the wall informed him that the structure would soon fall, and he told his jailers, who withdrew, taking him with them. They informed the king and Melampus was at once in demand, courted and feted. He married one of the king's daughters and was given large estates. In ancient Megaris he was worshipped and a temple erected in his honor.

MELANCHOLIA. See INSANITY.

MELANCHTHON, Hellenized name of Philipp Schwarzerd (Eng. "black earth"), German reformer: b. Bretten, in the Palatinate, 16 Feb. 1497; d. Wittenberg, 19 April 1560. He was left an orphan in his 10th year and taken into the house of his grandmother, a sister of Reuchlin (see REUCHLIN, JOHANN), the great German humanist, by whom he was affectionately treated and encouraged in his studies. In his 12th year he entered the University of Heidelberg and two years later was graduated bachelor. While he was occupied as tutor to the son of Count von Löwenstein, he continued to give attention to his own progress in Greek; in 1514 was made master of arts at Tübingen and thenceforth devoted himself to humanism, lecturing on Cicero, Terence and Greek grammar. He also gave much time to the study of theology, jurisprudence and medicine. Here he first became acquainted with Erasmus' edition of the New Testament, and was through the influence of Reuchlin elected professor of Greek in the newly founded University of Wittenberg. He delivered an inaugural address (29 Aug. 1518), 'De Corrigendis Adolescentiæ Studiis,' which produced a revolution in German educational methods and above all met with the approbation of Luther, professor of philosophy at Wittenberg. From this time Melanchthon became 'Preceptor Germaniæ' (The Schoolmaster of Germany), and the 'Ally of Luther.' These two champions of the Reformation were brought still closer together by their union at the 'Leipzig Disputation' (1519), in which they were confronted by Dr. Eck (see ECK, JOHANN VON) the great opponent of Luther and the movement he was inspiring. In his handling of this adversary, both orally and by his writings, Melanchthon showed himself to be the leader of Protestant controversialists and the most learned, judicious and ready of Protestant disputants.

In 1520 he married Katharina Krapp, daughter of the burgomaster of Wittenberg, and "Master Philip," as he was familiarly called, as he settled down to domestic life, was placed on the theological faculty of the university, and the first fruit of his increased application to the theological study and teaching was his 'Loci Communes Rerum Theologicarum,' which was

the first declaration of the Protestant position delivered in formal terms of dogmatic theology. The volume ran through 60 editions in his lifetime, and established its author's position as Luther's complement — in some respects the lesser spirit of the Reformation movement, but the scientific talent which supported on the intellectual side the genius and the faith of Luther. Melanchthon, by his historic learning, by his power over the classic languages, was enabled to communicate to the learned world the real principles of the new movement and the facts of the past on which it was founded. He brought to bear his deep knowledge of theological philosophy, his acquaintance with the precise terms in Greek and Latin of scriptural, patristic and scholastic statement on the main question of the dispute, and he had the calmness of the well-balanced humanist which enabled him to direct with cool and even mind the movements of his party and to keep it as free as possible from the fury and blindness of intolerance. His knowledge of Greek made him as useful to Luther in translating the Bible as Parnell was to Pope in the production of his 'Iliad.' His pen had an immense influence in securing the after success of the initiative taken by bolder but less cautious and reasonable spirits, and left a mark on the German Reformation deeper, more permanent and characteristic than that of any among his most enthusiastic contemporaries. His 'Epitome Doctrinæ Christianæ' became from the first an influence which establishes its claim to be called the pandect and code of European Protestantism.

The spirit of Melanchthon was distinctly irenic. The Reformation had resulted not only in a German revolt from the papacy, but in the creation of a host of jarring Protestant sects. Melanchthon's broad and far-seeing spirit was averse to division of any kind. The Augsburg Confession which was presented to the diet in 1530 surprised even the Roman Catholics by its moderate tone. It was drawn up by Melanchthon in accordance with memoranda supplied by Luther and it has all the breadth, calmness and judicial cautiousness of Luther's friend and good genius. But this spirit of compromise, hopefulness and patience was out of harmony with the passion for controversy which made Wittenberg a centre of storm and strife. Melanchthon, however, stuck to his post at Wittenberg long after the great power and influence he once wielded had passed from him into the hands of more positive, violent and aggressive leaders. There occurred a breach between the Philippists, the followers of Melanchthon and the Lutherans, who adhered to the extreme views of his friend on the subject of free will and irresistible grace, on the doctrine of the Lord's Supper, and on the "adiaphora" indifferent matters, as the former was inclined to term the ceremonies of the Roman Catholic Church. He and his followers were assailed as "rogues" and "worshippers of Baal." Luther stated his own views on the sacrament with such violence that the recollection of his 'Short Confession respecting the Lord's Supper' filled him with remorse on his death bed, where he acknowledged to his friend "Dear Philip, I confess to have gone too far in the affair of the Sacrament." The death of Luther left Melanchthon to the mercy of such zealous and fiery sectaries as had been engendered in that teeming period of intellectual and theological movement, which the monk of Wittenberg had inaugurated. He survived Luther four years, waiting for death, he said "as a refuge from the phrenzy of theologians," and praying that the Protestant world might find its way at last to reunion, a prayer which as yet remains unfulfilled.

Melanchthon's important part in the Reformation movement has often been lost sight of in the blaze of Luther's more striking and popular personality. Yet he may with some reason be called the brains of the Reformation. More than that, he was a man who, while he stood for progress, was averse to revolutionary change. In one sense he was the Mirabeau of a religious revolution, a constructive rather than a destructive reformer, a man born in a generation, which he could only affect by presenting an example of intellectual refinement, moderation, tolerance and conservation, which the warring giants of the Reformation refused to follow. In 1865 a statue was raised to him at Wittenberg and in 1883 a group comprising Melanchthon and Luther at Leipzig. His works are found complete in 'Corpus Reformatorum,' 28 vols. (1834-60). Consult Schmidt, 'Philipp Melanchthons Leben und ausgewählte Schriften' (1861); Richards, 'Philipp Melanchthon' (1898); Neander, 'Vita Quattuor Reformatorum' (1846); Hartfelder, Karl, 'Philipp Melanchthon als Præceptor Germaniæ' (Berlin 1899).

MELANESIA. (Greek, *melas*, black *nēsos*, island), in which the reference is to the extreme blackness of the people rather than of the islands themselves, is the designation applied to the islands of the western region of Oceanica. They extend northwestward in three interlacing chains, from New Caledonia on the south to the Bismarck Archipelago on the north. East of New Caledonia lie the Loyalty Islands, northeast of the Loyalty Islands begin the New Hebrides, and these are succeeded by the Santa Cruz, the Banks and Swallow groups. A little to the west of these begin the Solomon Islands, and considerably east of this archipelago lies a chain of small islands which are geographically to be classed in Melanesia, but ethnologically are distinctly Polynesian. In the partition of the Pacific among the European powers New Caledonia and the Loyalty Islands belong to France, the New Hebrides are held jointly by France and Great Britain, the Santa Cruz and the Solomon Islands form a British protectorate. Bougainville and Buka, the northernmost of the Solomon Islands, joined for purposes of administration with the Bismarck Archipelago, formed a part of the German colony of Kaiserwilhelmsland; this colony was captured in September and October 1914, by the Australian contingent, on its way to the World War. Economically, Melanesia has been but little exploited. The French in New Caledonia have worked with considerable success extensive mineral operations, the garnierite being the richest known ore of nickel and being found in beds which in general may be worked as open quarries. In the New Hebrides the French have established extensive plantations with every promise of future industrial success. The other islands of Melanesia remain in almost unmodified savagery, and only within the last few

years has any considerable attempt been made to utilize their extensive groves of coconut. Missionary effort in Melanesia has for the most part followed the flag; Catholic missionaries are engaged upon the conversion of the New Caledonians, Presbyterian missions have engaged with the southern New Hebrides, the Melanesian Mission of the Church of England is active in the New Hebrides and the Solomons, and in the Bismarck Archipelago the Australian Wesleyan Connection had a flourishing mission at Mioko before the German annexation, after which they were paralleled by the efforts of German missions, both Catholic and Protestant. The inhabitants of Melanesia vary so considerably in form and language as to lead to the conclusion that probably three distinct racial types are to be found within the area, in addition to a certain admixture of Papuan characters which have filtered into the northern areas of the region. Between island and island, even between village and village on the same small island, the difference of speech amounts to complete incomprehensibility. In general it is to be said that the Melanesians are very close to the lowest level of savagery; polygamy, infanticide and cannibalism are constantly practised, yet the people are of an agreeable disposition and very attractive to all such as are brought into contact with them. The cultural position of the Melanesians is markedly distinct from that of the Polynesians in several important particulars: The bow is in use. the art of pottery is very generally practised, the loom is found in one area, the taboo does not exist in any sense of moral control, the authority of chiefs is very limited and scantily invested with the idea of hereditary succession, shell money is used as a circulating medium, and over a large and increasing area of Melanesia sirih (betel) chewing is extensively practised. Consult Codrington, R. H., 'Melanesian Languages' (Oxford 1885); id., 'The Melanesians: Studies in their Anthropology and Folk-Lore' (Oxford 1891); Haddon, A. C., 'Head-Hunters, Black, White and Brown' (London 1902); Guppy, 'Solomon Islands and their Natives' (ib. 1887); Imhans, 'Les Nouvelles-Hébrides' (Nancy 1890); Seligmann, 'The Melanesians of British New Guinea' (Cambridge 1910).

MELANESIANS. See MELANESIA.

MELANISM, an excess of pigment in the skin and its appendages, producing real or comparative blackness; the opposite of albinism (q.v.). Melanism is less frequent than albinism, but more inclined to affect large numbers of individuals of a species, forming melanistic varieties and is seen not only in man but in other mammals and in birds, reptiles, fishes, and in insects as, for example, certain moths which are found in Labrador and in the White Mountains of New Hampshire, showing a possible connection between melanism and cold or high altitudes. Moisture is also considered to be a determining factor, as is indicated by the fact that the darkest races of men inhabit the warmest and dampest regions of the earth. A conspicuous example of melanism is afforded by the American "black" squirrels, which are melanistic varieties of various species, especially the fox-squirrel (*Sciurus niger*) and the gray squirrel (*S. carolinensis*). These varieties prevail in certain parts of the country, as the region of the Great Lakes and upper Mississippi Valley, and rarely occur elsewhere. Thus a black squirrel is almost unknown in New England or the Hudson Valley. Another familiar example is found in the black leopards, which in a direct light seem absolutely black, but under reflected light betray a pattern of spots similar to those of the ordinary leopard. Such examples, as is the case with other melanistic animals, often occur in the same litter of young with normal forms. In many of the lower animals, as butterflies, melanistic tendencies are developed under certain conditions, especially of excessive moisture. The pigments in the skin are mainly of the class called Melanins, which produce dark hues. Total abnormal melanism in man is unknown, but cases of partial melanism are on record. In one instance one-half of the face was white, the other black. A case is on record of a 16-year-old girl, a laundress, whose neck, face and upper chest became blue on certain occasions. She was otherwise apparently normal but the skin was so pigmented that when she blushed her color was blue instead of red, the change appearing with chameleonic rapidity and being associated with the accession of blood to the skin. A white towel was stained blue by being rubbed over her skin. Other cases of skin discoloration are that of a man who became black in places and yellowish brown in others, and that of an unmarried woman white until she was 21 and thereafter black as a negro. The cause of this condition is unknown. Melanoderma, chloasma, and liver-spots are terms applied to irregularly shaped yellow, brown and black colorations of the skin. Some of these spots are due to scratching following the bites of body-vermin, to prolonged pressure upon a portion of the skin, prolonged use internally of preparations of silver, to racial admixture, general diseases, such as cancer or tuberculosis, etc. See COLORING MATTERS; COLORATION, PROTECTIVE.

MELANITE (Gr. "black"), a very black variety of garnet, especially the lime-iron variety, in which lime largely preponderates in the protoxides. Melanite occupies a place midway between schorlomite and the garnets pure and simple; this is notably true of the sort containing the rare element titanite (q.v.). The group includes all the darkish garnets, with the exception (made by Dana) of the precious garnet, technically the pyrolite, which varies from red to black. With the green demantoids the blackish melanites make up the greater part of Dana's second class of garnets, the iron garnets.

MELANORRHŒA, mel"ą-nō-rē'ą. See VARNISH TREE.

MELANOSIS. See TUMOR.

MELANTERITE (Gr. *μελάντερος*, "blacker"), in mineralogy, the native hydrous sulphate of iron; iron vitriol. It is the native form in which copperas occurs, is green in color and has a glassy lustre.

MELASMA (Gr. "black spot"), a disease marked by discoloration of the skin. The term is rightly used in connection with a pigmentation of the skin, sometimes diffuse (color varying — dusky yellow, greenish brown, or even

black), and believed to be dependent upon degeneration of the suprarenal capsules or the semilunar ganglia. (See ADDISON'S DISEASE). Sometimes the term is applied to the conditions known as liver-spots and "moth-patches."

MELASTOMACEÆ. See DEER GRASS.

MELBA, Nellie, Australian prima donna: b. Melbourne, about 1860. She studied there in the Presbyterian Ladies' College; then took up music under Marchesi in Paris. On 15 Oct. 1887 she made her début in Brussels in 'Rigoletto'; at that time gave up her family name Mitchell and took the stage name Melba, which is said to have been suggested by the name of her native city; in 1889 she appeared in Paris at the opera, where she stayed for three years, during which she appeared in London in Italian repertoire; and after 1892 toured Europe and America. Her best rôles are Ophelia, Juliette, Lucia and Nedda in 'I Pagliacci.' She was married to Charles Armstrong in 1882. Consult Murphy, G. A., 'Nellie Melba' (London 1909).

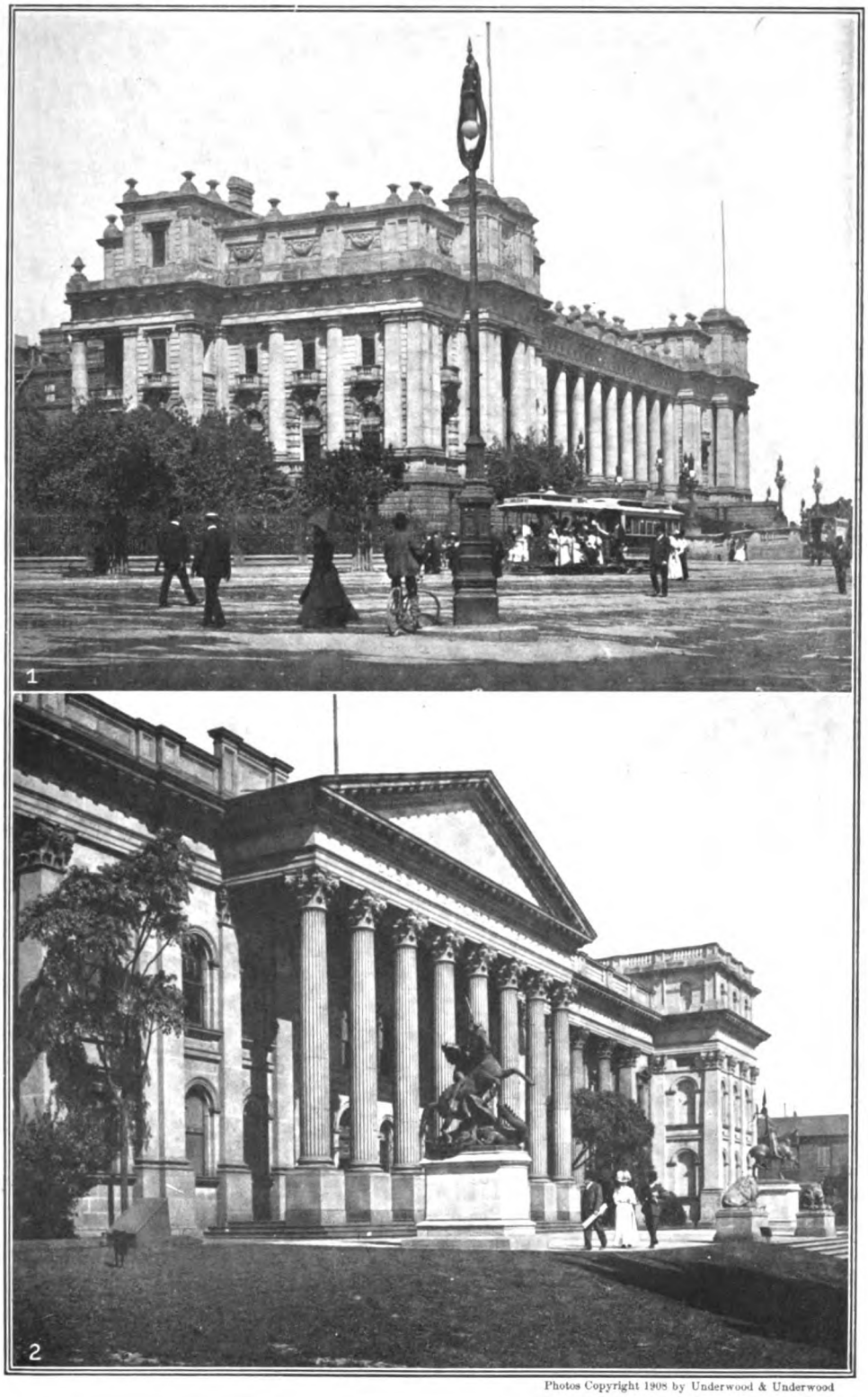
MELBOURNE, měl'bèrn, **William Lamb,** VISCOUNT, English statesman: b. 15 March 1779; d. 24 Nov. 1848. Carefully trained by his mother, he entered Eton in 1790, Trinity College, Cambridge, in 1796, and Lincoln's Inn in 1797; studied law in Glasgow; was called to the bar in 1804; and in 1805 was elected to the House of Commons, where he followed Fox, leader of the opposition. He lost his seat in 1812 because of his vote for Catholic emancipation; was returned in 1816; served as chief secretary in Ireland in 1827; and in 1828 entered the House of Lords upon his father's death. Only then did he begin to figure in politics, and that only because of his popularity, for he had no official ability, being neither diligent nor brilliant. As home secretary under Grey in 1830 he was a failure; but in July 1834 the king induced him to form a ministry, and again in 1835, in spite of the king's effort to foist Peel on the country in November 1834, he became Premier. He remained in office until August 1841, thus covering the early years of the reign of Victoria, whom Melbourne ably instructed in the duties of her position. His tuition of the young queen seems, however, the only event of his long administration, and he must be classed rather as a politician than as a great statesman, since he was scarcely more than indifferent to the reform measures of the day. He was a man of much learning, of a rather attractive, though coarse and habitually profane, wit and of a strange admixture of constitutional conservatism and political liberalism. His wife, Lady Caroline Ponsonby, whom he married in 1805, was separated from him in 1825; she wrote several novels and was a friend of Lord Byron. See NORTON, CAROLINE ELIZABETH; and consult Torrens, W. M., 'Memoirs.'

MELBOURNE, Australia, the capital of the state of Victoria, and the largest city of Australasia, situated around Hobson's Bay, at the northern extremity of Port Phillip, 40 miles north of its entrance from the ocean between Points Lonsdale and Nepean. The city and its numerous suburbs occupy an extensive undulating area, with the Yarra River, a stream of no great size, winding through it. The central and most important business part of the city is on the north bank of the Yarra, two miles by a direct railway line from the river's outlet in Hobson's Bay, but nine miles by the meandering water route. The city is built on a rectangular plan with fine wide streets lined with handsome and substantial public buildings and residences. Numerous lines of railway connect with the interior and the extensive suburban districts, which include such important places as Collingwood, North Melbourne, Fitzroy, Carlton, Brunswick, South Melbourne, Richmond, Prahran, Saint Kilda, Port Melbourne, etc. The city is well lighted, and paved, and is abundantly supplied with water, but the drainage, although much has been done toward its improvement, is still defective. Street railways traverse all the principal city and suburban thoroughfares.

The public buildings of Melbourne are noteworthy. The Houses of Parliament form a remarkable pile with a splendid west façade. Government House is a palatial building conspicuous from every part of the city, with a tower 145 feet high. Other public buildings include the law courts, forming an extensive square, the post-office, the custom-house, the treasury, the land and mining offices, the mint, the free library with some 300,000 volumes; the university, with an admirable museum belonging to it and a splendid hall (the Wilson Hall) in the Gothic style; the Ormond Presbyterian College; the town hall, with a large assembly room containing a splendid organ; the exchange, observatory, meteorological station, and athenæum. The ecclesiastical buildings include an Anglican Cathedral, a Roman Catholic Cathedral and the Scots church, with a fine steeple. There are several "sky-scraper" office and store buildings; many banks and business premises are attractive; and the Exhibition building deserves notice. At the head of the educational institutions is Melbourne University (about 930 male, 320 female students annually), with which are affiliated the three denominational colleges, Trinity (Episcopal), Ormond (Presbyterian), and Queen's (Methodist). Charitable and benevolent institutions are numerous. There are several parks and other grounds for public recreation, and among these the Botanic Garden deserves special notice on account of its extent (100 acres), its beauty, and the value of its collection of trees and plants. The beautiful Fitzroy Gardens also deserve special mention. Melbourne is the see of a Roman Catholic archiepiscopate and of an Anglican bishopric. The United States is represented by a consul-general. The chief industrial products of Melbourne are leather, furniture, clothing, flour, ales, cigars, ironware, woolen, etc. The shipping trade is large both in exports and imports, the chief of the former being wool and gold, of the latter manufactured goods. Most imports are subject to a heavy duty. Vessels of 26 feet draught can ascend the Yarra. Its navigation has been much improved, and the Coode canal shortens the passage. The largest vessels are accommodated at Port Melbourne and Williamstown, with depths of about 30 feet, both on Hobson's Bay; Port Phillip Bay affords unlimited anchorage for the largest vessels. The tonnage of vessels entered 1915-16 was 5,290,318. Pop. of Melbourne, including the suburban municipalities, 684,000, nearly half the population of the state.

The first settlements on the site of Melbourne were made in 1835, and a year or two

MELBOURNE, AUSTRALIA



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1 Parliament Building, Melbourne

2 Public Library, Melbourne

after it received its present name, being so called after Lord Melbourne, who was then British prime minister. It was incorporated in 1842 and became a bishop's See in 1849. In 1851 it became capital of Victoria (then established as a separate colony), and received an immense impetus from the discovery of gold fields.

A centennial exhibition was held in 1888 in celebration of the founding (in 1788) of the Australian colonies. A great conflict between labor and capital took place in 1890, and a strike by the labor-unionists took place on a very extensive scale both in Victoria and New South Wales. In 1892–93 Melbourne suffered severely from commercial depression, financial crises and banking disasters. The first Parliament of the Commonwealth of Australia was opened in the Exhibition Building on 9 May 1901 by the Duke of Cornwall and York (afterward George V). Consult 'Victoria and its Metropolis, Past and Present' (1889); Gordon and Gotch, 'Australian Handbook' (1906).

MELCHERS, Paulus, German cardinal: b. Münster, Westphalia, 6 Jan. 1813; d. Rome, 14 Dec. 1895. He studied law at Bonn and theology at Munich and Münster; was ordained priest in 1841; in 1857 became bishop of Osnabrück, and in 1865 Pope Pius IX nominated him archbishop of Cologne. At first opposing the doctrine of papal infallibility at the Vatican Council, Melchers afterward accepted it, in agreement with the majority, and dealt severely with professors who sought to prevent its declaration. In the Kulturkampf (q.v.) his conspicuous activity brought him into collision with the representatives of government, and in 1876 he was removed from his archbishopric. His writings include 'Eine Unterweisung für das heilige Altarsakrament' (1878); 'Die katholische Lehre des Herrn' (1883), and 'Das Leben der allerseligsten Jungfrau und Gottesmutter' (1884).

MELCHITES, mĕl'kīts, those Christians of western Asia and of the Levant who acknowledge the supremacy of the Roman Pontiff and accept the dogmas of the Roman Catholic Church. The Syriac and Egyptian congregations of this name in the main belong to the Greek Church though in some unimportant matters of ceremony and discipline they take an independent course. They are, however, under a chief bishop of their own, who is styled patriarch of Antioch. The term Melchites is a nickname. It means "Royalists" and was given to them by the orthodox Greeks with the implication that they accepted the decrees of the Council of Chalcedon merely at the dictation or in conformity with the example of the emperor. Celibacy is imposed upon their bishops, but their priests are at liberty to marry. Their liturgy is in the Arabic language; they use unleavened bread in the Eucharist and in their monastic houses they follow the Basilian rule. There are said to be 100,000 of them. Consult Neale, 'History of the Eastern Church.'

MELCHIZEDEK, mĕl-kĭz'ĕ-dĕk ("king of righteousness," that is, righteous king), in the story of Genesis, king of Salem and priest of "Supreme God." He met Abram on his return from the victorious expedition against Chedorlaomer, gave him his blessing and received tithes from him. The antelegal king-priest stands in Psalm cx as a figure typical of the Messiah the vicegerent of Jehovah, and in Hebrews vii, 3, of the kingly priesthood of Jesus. There are various views as to the identity of Melchizedek, as he is named in many ancient writings. Rabbi Kaufmann Kohler of the Hebrew Union College, Cincinnati, states in the 'Jewish Encyclopedia' that the personality of Melchizedek rests upon ancient Jewish tradition, and identifies him with Malki-Zedek, first king of Zedek, the ancient name of Jerusalem. Philo speaks of him as the "Logos"; others believe he was Shem, ancestor of Abraham. The chapter in Genesis containing his story is a unique passage of the Pentateuch, and according to Wellhausen is one of its latest additions. Ewald counts it the earliest portion of the history and based on old Canaanitish records; others, as Nöldeke, explain it as utterly unhistorical.

MELCHTHAL, mĕlH'täl, **Arnold von** (ARNOLD AN DER HALDEN), Swiss patriot. He is considered by some authorities to be a mythical character, but was supposed to have lived in the 14th century. He incurred the wrath of the governor and was compelled to flee to escape punishment, whereupon the governor seized Arnold's aged father and had his eyes put out. The son, enraged at this barbarity, with two friends planned a revolt against the Austrian power which they successfully conducted. Consult Ægidius Tschudi, 'Chronicon Helveticum' (1505–72).

MELDOMETER. See MELTING POINT.

MELEAGER, according to Greek legend, the hero of the Calydonian boar hunt. The earliest form of the story is found in the 'Iliad,' according to which Meleager is son of Æneus, a king of Ætolia, and Althæa, daughter of Thestius. When the boar had devastated the land Meleager gathered a band about him and after a great struggle and with considerable loss of life slew the monster. A quarrel over the spoils arose between the Ætolians and the Curetes, the latter being under the leadership of Meleager's maternal uncles. In the quarrel the latter were killed by Meleager, who was now cursed by his mother, who prayed the Furies and gods of the nether world to destroy him. The hero withdrew from the fight until the Curetes stormed the town when he launched forth to save his people and was slain, according to some, by the Furies, according to others by the hand of Apollo. Other versions of the story were current in later times, one of which is preserved in an ode of Bacchylides. The Calydonian Hunt was a favorite subject with artists from early times, and a copy of a work by Scopas, executed originally for one of the pediments of the temple of Athena Alea at Tegea, is now in the Vatican, Rome. In the Fogg Art Museum of Harvard University is an excellent replica of the Vatican copy.

MELEDA, Austria, an island off the southern coast of Dalmatia in the Adriatic. It is about 25 miles long and the Austrian name is Babinopolie. It is believed by some to be identical with Melita on which Saint Paul was stranded.

MELENDEZ VALDES, Juan, hoo-än' mā'lĕn'dĕth väl-dās'. DON, Spanish poet: b. Ribera del Fresno, Badajoz, 11 March 1754; d. Montpellier, France, 24 May 1817. He studied law at Salamanca, where he attracted attention by his poems in the old ballad manner and was taken up by the poet Cadalso. In 1780 he received the first prize in a competition under the control of the Spanish Academy for his pastoral 'Batilo,' and, in 1784, his comedy, 'Las Bodas de Camacho,' won a prize from the city of Madrid, although unsuccessful on the stage. In Madrid he won the favor of Jovellanos, who appointed him professor of the classics in the University of Salamanca and urged him to enter upon an unfortunate political career; he became judge in 1789, a judicial chancellor at Valladolid in 1791, and fiscal in the Supreme Court in Madrid in 1797. He suffered brief exile after the fall of Jovellanos (q.v.) in 1798; but in 1802 returned to Salamanca. His sympathy with France, however, made him more than ever unpopular, and after the expulsion of Joseph Bonaparte, he went into exile in France. He was one of the most prominent figures in Spanish literary life during the 18th century.

MELETIUS, (1) founder of the sect of Meletians. He was bishop of Lycopolis in the 4th century, and antagonized Peter, patriarch of Alexandria, by refusing absolution and communion to the lapsed, that is, those who under the stress of persecution had renounced their faith. A schism resulted from the dispute and Meletius traveled through Egypt and Syria gathering thousands of followers, until the Council of Nicæa, 325, deprived him of authority and he died soon after, a merely titular bishop. (2) Another Greek ecclesiastic of the same name and century, who was made bishop of Antioch in 360, when the Arian controversy was at its height.

MELGAREJO, Mariano, mä-rē-ä'nō mälgä-rä'hō, Bolivian soldier: b. Cochabamba, Bolivia, 18 April 1818; d. Lima, Peru, 23 Nov. 1872. He entered the army at an early age and by his courageous though somewhat unprincipled conduct in the many revolutions in his country, rose to be chief adviser of General Acha in 1862 and was made a general. In 1864 he turned against Acha who was then President, instigated a revolution and seated himself in the presidential chair. During a brief absence of Melgarejo the ex-President Belzu returned and reinstated himself in the presidency only to be shot by Melgarejo himself, who then became dictator. He crushed a revolution in 1866 and in that year formed an alliance with Spain against Peru and Chile. Revolutions followed and he was compelled to flee the country in 1871 and was killed in a quarrel at Lima.

MELIC GRASS (*mel,* honey), delicate genus of grasses growing in the shade of woods, of the order Gramineæ, having a lax panicle and spikelets of 2–5 awnless florets, of which one generally is imperfect. *M. uniflora* is of graceful and delicate appearance; cattle are fond of it. This species is common in Europe. *M. nutans* is common in the United States west of the Rockies. *M. altissima,* a Siberian species, growing to the height of three or four feet, has been introduced in parts of Europe, and yields a considerable bulk of herbage. It is perennial.

MELICERTES, son of Athamas and Ino. In fear of Athamas, whose children by Nephele, Phrixus and Helle, she had tried to kill, Ino jumped into the sea with Melicertes. She became the sea divinity **Leucothea,** he Palæmon, whom the Romans identified with their god of harbors, Portunus. Some identify him with Moloch. It is recorded that children were sacrificed to him at Tenedos.

MELICOCCA (*μέλι,* honey —*κόκκος,* berry), genus of trees or shrubs of the natural order Sapindaceæ, comprising about six species, one of which *M. bijuga,* native of the West Indies, is there universally cultivated for its fruit. It is called the honeyberry and the Jamaica bullace plum; by the Spaniards, Monos; by the Dutch, Knipnee. It is 16 to 20 feet high. The fruit has an agreeable flavor and varies in color from yellow to jet black. It is now grown in California and Florida. When roasted the seeds may be eaten after the manner of chestnuts. Some other species also yield edible fruits.

MELIHAH, the salting of meat according to Jewish ceremonial, that it may be without blood and ritually fit for eating, thus complying with the law (Gen. ix, 4).

MELIKOFF. See LORIS-MELIKOFF.

MELILITE, or MELLILITE, a native silicate of sodium, calcium, magnesium, aluminum and iron. Potassium is also commonly present to some extent. Melilite crystallizes in the tetragonal system and has a vitreous or resinous lustre and usually a honey-yellow color, from which circumstance it derives its name (Greek, "honey"). It is brittle, translucent (at least in thin layers), and distinctly pleochroic. It has a hardness of about 5 and a specific gravity of 3. The mineral occurs in basic eruptive rocks and is also observed, quite frequently, in the slag from furnaces. It is sometimes called mellite.

MELILLA, Africa, a port of Spanish Morocco, about 150 miles east of the Strait of Gibraltar. The exports in 1915 totaled £168,145. A Spanish military command is located there, a wireless station and an aviation corps, the latter having a range of 320 miles. It has been used by Spain also as a penal settlement. Pop. about 9,000.

MELILOT, a genus (*Melilotus*) of annual, biennial and perennial herbs of the family *Fabaceæ.* The species of which there are about a dozen, are natives of western Asia and the Mediterranean region and have become widely distributed in temperate and subtropical climates. They are upright, alfalfa-like plants with small yellow or white flowers which are borne from late spring until frost. The pods are few-seeded and not twisted as in the closely related genus *Medicago* (q.v.). The two best known species are yellow melilot (*M. officinalis*), an annual, and white melilot (*M. alba*), a perennial, which are common weeds in waste places, the former especially upon dry, clayey soils, the latter in damp situations. Like other members of the genus they are sweet-scented, particularly while drying, and their flowers are used to some extent for perfumery.

MELINE, James Florant, American lawyer and author: b. Sacket's Harbor, N. Y.; d.

Brooklyn, N. Y., 14 Aug. 1873. He was graduated at Mount Saint Mary's College, Emmettsburg, Md., and went to Cincinnati, where he was one of the professors at the Athenæum, and, while teaching, studied law. He was also one of the editors of the *Catholic Telegraph*. After spending some time abroad in study and travel he returned to Cincinnati, was admitted to the bar and commenced the practice of law; later he relinquished his profession and established a banking business, also holding consulates for France and other nations. In 1860 his business failed and shortly afterward he enlisted in the Federal army. He served throughout the Civil War under General Pope, attaining the rank of colonel, and after the war was for two years chief of the Bureau of Civil Affairs in the third military district. At the end of that time he went to New York and devoted himself to literary work, writing for the *Galaxy*, the *Nation* and the *Catholic World*. In the latter periodical he first published the articles controverting Froude's statements and conclusions in regard to Mary Queen of Scots; these articles, which aroused wide interest, were afterward revised and published in book form under the title 'Mary Queen of Scots and Her Latest English Historian' (1871). He also wrote 'Two Thousand Miles on Horseback' (1867); 'Commercial Traveling' (1869), and 'Life of Sixtus the Fifth' (1871).

MÉLINITE, mā'lĭn-īt, an explosive employed by the French government late in the 19th century, in charging torpedo shells and in the preparation of rupturing charges for the use of the engineer corps and cavalry in effecting demolitions. As originally used it was composed of 70 per cent of picric acid mixed with 30 per cent of pyroxylin dissolved in 45 parts of acetone. Later it consisted exclusively of fused picric acid which was poured into the shell when in the molten condition and cast there in such a manner as to leave a central canal in the mass in which the fuse terminated in a mercuric fulminate detonator by which the charge was fired. By the use of this fuse the detonation of the charge was delayed sufficiently to allow the shell to penetrate armor and reach the farther side of it before the explosion. Mélinite was very thoroughly tested at Bouchet in 1892 to determine the degree of safety that it possesses when exposed to shocks, fire and the accidental rupture of receptacles containing it, and the results were most favorable. The name, like that of other explosives, is going into disuse because of the practice of describing explosives by their principal constituents.

MELIORISM (Lat., *melior,* better), the belief that the improvement of the world by human effort is possible, and implying also the further belief that the world is *de facto* being gradually so improved and that such improvement is a law of evolution. The term was used first in conversation by the novelist, George Eliot, who desired to formulate a *via media* between the views of optimism and pessimism so prevalent in her day. Sully adopted the term in his 'Pessimism' (1877), since when it has come into general use. By Sully meliorism is described as "the faith which affirms not merely our power of lessening evil — this nobody questions — but also our ability to increase the amount of positive good. . . . By recognizing the possibility of happiness and the ability of each individual consciously to do something to increase the sum total of human welfare present and future, meliorism gives us a practical creed sufficient to inspire ardent and prolonged endeavor." The opponents of meliorism have connected it with the theory of evolution. Evolution by them is presented in a semi-religious light, inasmuch as they believe in a gradual abatement of evil through progressive evolution. This view is not confined to philosophers of this school, however, but is now the view of many agnostics, who unwarily have assumed this unconsciously religious conception of the universe. Consult Fraser, 'Theism.'

MELISSA, a plant. See BALM.

MELISSUS, mĕ'lĭs-ŭs, Greek philosopher: b. Samos, about 480 B.C. He was the son of Ithagenes, and is said to have been a friend of Heraclitus and to have commanded the fleet opposed to Pericles in 440 B.C. in the Samian War. Some fragments of a prose work of his, written in the Ionic dialect, have come down and have been collected and published by Brandis and by Mullach (1846). From these he appears to have been a philosopher of the Eleatic school and to have reached more definiteness and consistency than Parmenides. He reasoned that being was eternal, and could not have a beginning, else it would start with non-being; by like reasoning, there can be no destruction of being, for it would have to become another and opposite thing. Void he holds to be nothing, which is not, and therefore unthinkable. He concluded that being was incorporeal, because a body has size and parts.

MELITA, mĕl'ĭ-tą, the island on which Saint Paul, on his voyage to Rome, was cast away. This has generally been considered to be the Island of Malta, the ancient name of which was Melita, and one of whose bays has from immemorial time borne the name of Saint Paul; but some critics have attempted to prove that it was an island, the modern Meleda (q.v.), on the coast of Dalmatia, in the Adriatic.

MELKART (Phœnician, "God of the City"), name of the presiding deity of the city of Tyre and of the whole Tyrian nation, namely, Baal (q.v.), the sun god. He is sometimes identified with the Heracles or Hercules of the Greeks. He was the patron god of mariners and the Phœnician colonies of the West, in Africa and Spain, were under his protection. To him has been ascribed the subjugation of the savage races who anciently peopled these regions and the building of early Phœnician towns. The institution of order and legislation in these cities was also said to have been his work. Many are the voyages which he is related to have made. One of his exploits was the rescue of Astarte from the darkness in which the moon had imprisoned her in the West; he afterward made her his wife. For an account of the Temples of Melkart at Tyre consult Jeremias, 'Tyrus bis zur Zeit Nebukadnezzar' (1891).

MELKITES. See MELCHITES.

MELL, Patrick Hues, American educator: b. Walthourville, Ga., 19 July 1814; d. Athens, Ga., 26 Jan. 1888. He was educated at Amherst and after teaching for several years was appointed professor of ancient languages at Mer-

cer University in 1842 and was also ordained a Baptist minister in that year. In 1856 he was appointed to the same chair in the University of Georgia, and in 1870 he became vice-chancellor, which post he resigned in 1872. In 1878 he was appointed chancellor and in 1880 was elected to the chair of metaphysics and ethics, which offices he occupied at his death. He held several pastoral charges and was president of different conventions in addition to his educational work and published 'Baptism' (1852); 'Parliamentary Practice' (1868); 'Church Polity' (1878).

MELL, Patrick Hues, American scientist: b. Penfield, Ga., 24 May 1850. He was a son of the preceding, was graduated at the University of Georgia in 1871 and was State chemist in 1874–77. In 1878 he was called to the chair of geology and botany at the Alabama Polytechnic Institute and continued in that position until 1902, when he accepted the presidency of the South Carolina Agricultural and Mechanical College. In addition to his work in the universities he was connected in 1884–1902 with the Alabama Weather Bureau and the Agricultural Experiment Station and he invented a system of weather bureau signals which has been adopted by the United States Weather Bureau. He has published 'Southern Soapstones and Fireclays' (1882); 'Study of Cotton Plant' (1890); 'Life of Patrick Hues Mell, Sr.' (1895); 'Biological Laboratory Methods' (1902); etc.

MELLEN, Charles Sanger, American railroad president, b. Lowell, Mass., 16 Aug. 1851. He was educated in the public grammar and high school of Concord, N. H. He began his railway service 22 Sept. 1869 as clerk in the cashier's office of the Northern New Hampshire Railroad. In 1872–73 he was clerk to the chief engineer of the Central Vermont Railroad, in 1873–80 superintendent's clerk to the chief clerk and assistant treasurer of the Northern New Hampshire; assistant to the manager of the Boston and Lowell Railroad in 1880–81; auditor 1881–83; superintendent 1883–84; general superintendent 1884–88 of the Boston and Lowell and Concord railways. In 1888 Mr. Mellen became general purchasing agent, in 1889 assistant general manager, in 1889–92 general traffic manager of the Union Pacific system. In 1892 he became general manager of the New York and New England Railroad at Boston; from 1892 to 1896 was second vice-president of the New York, New Haven and Hartford; from 1896 to 1903 president of the Northern Pacific and from 1903 to 1913 president of the New York, New Haven and Hartford Railroad. From 1910 to 1913 he also served as president of the Boston and Maine Railroad. Mr. Mellen's administration of the New Haven road was severely criticized because of the efforts to secure a monopoly of transportation in New England. Trolley and steamboat lines were bought out and the equipment of the parent road was depreciated to such an extent that numerous wrecks resulted. Mr. Mellen retired from business in 1915.

MELLILITE. See MELILITE.

MELLO, Custodio José de, koos-tō'dē-ō hō-sā' dā mā'lō, Brazilian admiral: b. about 1845; d. 16 March 1902. In 1889 he took a prominent part in the revolution, was promoted to be admiral and was appointed Minister of the Navy. Four years later he formed a plot in behalf of the Federal party and the navy, against the party of the army and its candidate for re-election, President Peixoto; bombarded and blockaded Rio de Janeiro; and, when forced out of the harbor by vessels of foreign navies, notably American, occupied Rio Grande do Sul. He could not agree with his lieutenant, Saraiva, however, and so surrendered to the government of Argentina. In 1901 he was accused, in spite of his former republicanism, of plotting to establish an empire and was interned upon the island of Cobras.

MELLONI, Macedonio, mā-chā-dō'nē-ō mēl-lō'nē, Italian physicist: b. Parma, 11 Apr. 1798; d. Portici, near Naples, 11 Aug. 1854. He became professor of natural philosophy at the University of Parma, where between 1824 and 1831 he taught hygrometry. Political events having compelled him in the latter year to expatriate himself, he went to Geneva, where he made several important discoveries respecting the radiation of heat, which he presented in 1833 to the French Academy of Sciences. Later discoveries won him the Rumford medal from the Royal Society of London. Through the influence of his friends, Arago and Humboldt, he was enabled to return to Italy, and was appointed by the king of Naples director of the meteorological observatory on Mount Vesuvius. Among the results of his labors at this institution was the discovery of heat in lunar light, which led to the determination of the analogy of radiant heat to light. Political troubles again interrupted his labors, and for his presumed sympathy with liberal principles he was in 185- ejected from his post. In 1850 he published the first volume of a work entitled 'La termocrasi, o la colorazione calorifica,' containing an account of his theory of the "coloration of light," and of his experiments on the diffusion of heat by radiation, and particularly of its transmission through transparent media. Subsequently he gave much attention to the study of electricity and combated the conclusions of Faraday with regard to the transmission of currents over submarine wires.

MELOCACTUS, a cactus typical of the tropical American melon-cactus family, *Melocactidæ*. It consists of a globose or conical stem, having rows of spines at intervals and flowers at the top on a hemispherical or cylindrical head. There are more than 20 species. *M. communis* of the West Indies is the Turk's, Englishman's or Pope's-head cactus. The head bearing the flower is red and like a Turkish fez in form.

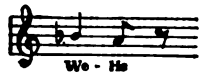
MELODEON, a musical wind instrument with a row of reeds and operated by keys. The rocking melodeon, known in America since about 1825, was unsightly, tardy in sounding and of harsh tone. Jeremiah Carhart in 181- conceived the plan of acting on the reeds by suction instead of blowing, and reversed, to this end, the bellows and reeds, inventing the present instrument in 1836. He thus secured prompt sounding and a flute-like quality of tone; "voiced" the note by curving the reeds, and made many other improvements. In a single year 22,000 of these instruments were manufactured in the United States, and they

were popular until the cheap parlor organ displaced them.

MELODRAMA (from the Greek *melos*, song, and *drama*, action), originally and properly a half-musical drama, or that species of drama in which the declamation of certain passages is interrupted by music. It is usually a tragedy of common life, filled with surprises, acts of violence and all that excites and sustains the attention of the audience, mixed up with dancing and music and sometimes with scenes of a rudely comic character. Probability is freely sacrificed for the sake of striking situations. The object is to be sensational and to catch the applause of the gallery. See DRAMA, THE.

MELODY, *in music,* a succession of single tones so arranged as to express a musical thought. A solo for one instrument or voice with or without accompaniment is the most typical example of a melody.

Melody is one of the most comprehensive terms used in music, being properly applicable to as few as two notes or to as many as the entire principal vocal or instrumental part of a composition. An example of the first is the motif of woe in Wagner's 'Der Ring des Nibelungs.'



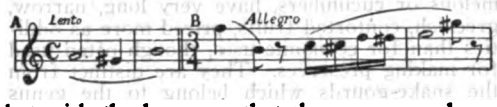
Examples of the latter are too numerous to require mention.

The term is also appropriately applied to a phrase or portion of a phrase in a part that has been subordinate to the principal one and which for a moment gains importance on account of its greater melodic significance. In concerted music, vocal or instrumental, the highest part is usually the melody, though as stated above an inner one may temporarily assume it. In polyphonic music all the parts are equally melodic.

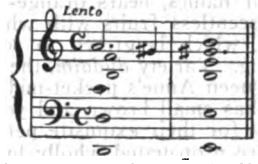
Melody is the outgrowth of the improvised recitatif. The early Greek singer standing before his audiences holding his four-stringed lyre or chelys, χέλυς plucked a string and recited his poem on that note until fancy impelled him to change it. From this crude ancestor has sprung melody as we understand it to-day, which with rhythm and harmony form the great trinity necessary for the complete expression of music. Melody is the only one of the three capable of suggesting enough of the other two to be satisfactory by itself. The folk-song of old and the popular song of to-day may be sung by a single voice without any

accompaniment and yet convey a very definite idea of the rhythm and something of the harmony that would naturally accompany the tune. Such a performance is, of course, incomplete and only effective in music of the simplest character. Yet it conveys much more than the mere rhythm of the tune played on a drum would give and still more than the mere harmony played without either the melody or the rhythm. It is curious that the Greeks with all their extraordinary achievements in all other forms of art should have advanced so little in music. No doubt they used music in their religious feasts and the cross flutes πλαγίαυλος and lyres supplied what they must have thought melody, but they do not seem to have ever dreamed of musical accent or rhythm, without which we cannot to-day call a succession of sounds melody, while harmony was unthought of for many centuries.

Melody is greatly affected by the harmony that the composer has wedded to it, and it is to this fact perhaps more than any other that originality continues possible, for with but 12 different notes from which to form a melody it is evident that even with all the variations that rhythm can add the melodic material is capable of exhaustion in the enormous and growing number of compositions. The following phrases of melody, especially the first, have no particular suggestion played alone:



but with the harmony that the composers have added they have an entirely different signification, the one of the great solemnity and foreboding, the other of harsh cynicism and sneering.



Motif of Fate "Die Walkuere"—Wagner.

HENRY GORDON THUNDER,
Conductor Choral Society of Philadelphia.

MELOIDÆ. See BLISTER-BEETLE.

MELON-CACTUS, or **MELON-THISTLE.** See MELOCACTUS.

MELON-PEAR, or **SHRUB.** See MELONS.

MELONS, a popular name for several unrelated plants, but more particularly for two members of the family *Cucurbitaceæ*, the muskmelon (*Cucumis melo*) and the watermelon (*Citrullus vulgaris*). The more important other fruits similarly known are the Chinese preserving melon (*Benincasa cerifera*) of the same family; the melon papaw (*Carica papaya*) of the family *Caricaceæ*, and the melon-shrub or melon-pear (*Solanum muricatum*) of the family *Solanaceæ*.

The muskmelon is an annual trailing herb which has been introduced by man into all tropical, subtropical and many temperate climates from southern Asia where it is native. It is characterized by long, running, hairy and somewhat prickly vines, roundish heart-shaped leaves, yellow monœcious flowers and usually edible fruits of very various forms and sizes. The following are the principal varieties: Variety *cantaloupensis*, the cantaloupes, or rock-melons, which have hard, warty or scaly rinds more or less furrowed, and flesh of various colors from white to red, green or yellow. In the United States the name "cantaloupe" is loosely applied to horticultural varieties of

other groups. Variety *reticulatus* includes the nutmeg or netted melons which have softer rinds, sometimes smooth, but usually more or less netted. To this group belong the larger part of the so-called cantaloupes in American markets. Variety *saccharinus* comprises the pineapple-melons which have very sweet flesh, but are not clearly distinct from the preceding group. Variety *inodorus*, the winter muskmelons, which have less hairy, lighter-colored vines and foliage and whose long-keeping fruits are deficient or entirely lack the characteristic muskmelon odor. This group is less cultivated in the United States than in the Mediterranean region, but because the fruits can be kept until Christmas or later when properly grown, gathered before frost and slowly ripened in a cool, rather dry room, they should become more widely popular where the seasons are long enough to permit their reaching such a stage of maturity. Variety *flexuosus*, the snake-melons or cucumbers, have very long, narrow, greenish, contorted fruits, prized more as oddities than for economic uses, though often used for making preserves. They are distinct from the snake-gourds which belong to the genus *Lagenaria*. A variety *chito*, called orange-melon, melon-apple, garden-lemon and many other popular names, bears orange- or lemon-like almost scentless fruits with white or pale yellow flesh, which is grown to some extent for preserving. Variety *dudaim*, the pomegranate-melon, Queen Anne's pocket-melon, dudaim melon, etc., has small brown and yellow fruits valued solely for their exquisite perfume.

Melons are propagated wholly by means of seeds, which may be sown directly in the field or started under glass upon inverted sods, in flower-pots, berry-boxes, etc., and transplanted to the field as soon as danger of frost has passed. The former method is practised most extensively in the South and in other warm climates where the seasons are long; the latter in the North because the shortness of the season demands that the plants obtain an early start. The soil best suited to melons is a light sandy loam well drained, well exposed to the sun and well supplied with plant-food. It should be deeply plowed, thoroughly harrowed and kept clean of weeds, especially before the plants are set and until the vines cover the ground. After harrowing, the ground is marked in checks about five feet square and 10 or 12 seeds, or five or six plants, are set in each "hill," from which all but the two or three strongest vines are removed after the insects have had their share. Often, especially upon rather poor or tenacious soils, two or three shovelfuls of well rotted manure is mixed with the earth of the hills to give the plants a little impetus. The fruits are gathered when they will readily separate from the stems, preferably in the early morning.

During the closing decade of the 19th century the demand for highly flavored melons was greatly increased by the apperance in the eastern markets of the Rockyford melon, a small fruit grown in Colorado. Its appearance in large quantities drew public attention to numerous other high flavored melons grown in other sections. As a consequence many inferior varieties have nearly disappeared from cultivation. Besides the Colorado melon fields there are large areas devoted to melon-growing in New Mexico and California. New Jersey, Maryland and Delaware produce immense quantities, the first-mentioned State especially; and the product is consumed largely in the cities of Pennsylvania and New York. The Mississippi Valley States also send considerable quantities to Northern markets.

The watermelon is an annual trailing herb, a native of tropical and southern Africa, whence it has been introduced by man into all tropical, subtropical and many temperate climates for its watery sweet fruits, which sometimes weigh more than 75 pounds, but usually range between 20 and 50 pounds. The vines are more hairy, lighter green, longer running than those of the muskmelon and the leaves are deeply notched, in some cases approaching the compound form. Except for a horticultural group of firm-fleshed varieties known as preserving watermelons or more popularly as citrons, the watermelon seems to have no varieties worthy the name of sub-species or botanical varieties, and even this group appears not to have received such designation.

In general, the watermelon requires the same treatment as the muskmelon, the soil being, if anything, lighter and more sandy, and the distances between hills about double, except for the smaller growing sorts. The principal producing regions are Georgia and Colorado, but the watermelon is grown largely in all the southern States, and some of the short-season varieties as far north as Michigan and Ontario. The watermelon is more easily shipped than the muskmelon, since the tough-rinded kinds may be placed in cars two or more feet deep, the smaller specimens upon the bottom, and shipped long distances. Muskmelons, being more delicate, must be barreled or crated. The fruits are used exclusively in the raw state and have no by-products such as vinegar, sugar, syrup or brandy. The rinds, however, when deprived of the hard exterior, are often preserved with raisins, etc.

Both muskmelons and watermelons are subject to the attacks of several insects, among which the small, black, striped cucumber-beetle (*Diabritica vittata*), the squash vine-borer (*Mellitia ceto*), the melon-caterpillar (*Margaronia hyalinata*), the cucumber flea-beetle (*Crepidodera cucumeris*), the squash-bug (*Anasa tristis*) and the melon-louse (*Aphis gossipii*) are the most important. Tobacco dust and plant protectors are largely used to prevent the attacks of the first, the adults of which feed upon the under sides of the leaves and the larvæ upon the roots. The melon-louse is fought with kerosene emulsion sprayed upon the under sides of the leaves or by fumigation with carbon disulphide. No effective remedy has been suggested for the borer. Arsenical sprays have been recommended for the caterpillars and other chewing insects. Since the insects are believed to spread diseases from plant to plant, melon-growers seek to prevent insect injury as far as possible and practicable. The diseases, of which a large number have been described, are much the same as attack cucumbers, and may be similarly controlled where control has been found possible. Some diseases, as wilt, have defied all tried remedies. This disease generally ruins the vines a week or 10 days before the fruits would be ready to harvest. Many of the complaints as to the

poor quality of eastern-grown muskmelons result from the sale of melons that have been gathered from blighted fields.

Consult Bailey, 'Cyclopedia of Standard Horticulture,' (New York 1916).

M. G. KAINS,
Crop Expert.

MELOPIANO, an invention by which sustained sounds can be produced on a pianoforte. It consists of a series of small hammers set into very rapid vibration by the winding up of a spring. See MUSICAL INSTRUMENTS, MECHANICAL.

MELOS, mē'lŏs, **MILO,** or **MILOS,** Greece, an island in the Ægean Sea, in the southwest portion of the Cyclades, about 65 miles east of the mainland. Its length, east to west, is about 14 miles and it is about eight miles in extreme breadth; area, 64 square miles. It is mountainous, Mount Ilias rising 2,543 feet, of volcanic formation, has hot mineral springs and mines of sulphur. The island was once famous for its riches, fertility and population, and corn, wine, cotton, oranges and other fruits are still grown. Sulphur, manganese ore, millstone, gypsum, etc., are exported. Plaka is the principal town and nearby are the ruins of Melos, the ancient capital. Kastron is a large village on the north coast. The island of Melos was first colonized by Phœnicians and afterward by Dorians. During the Peloponnesian War it was the faithful ally of Sparta till 416 B.C., when it was taken by the Athenians and its inhabitants massacred or sold as slaves. From 1204 till 1537 it formed part of the Venetian duchy of the archipelago. At the latter date it was taken by the Turks, with whom it remained till the epoch of Greek independence. Its ancient prosperity is claimed to be due largely to the fact that obsidian was found here, which was quarried and sold for making knives, hatchets and tools. In 1820 a peasant discovered here the celebrated statue known as the Venus of Milo now placed in the Louvre at Paris; the Poseidon in the National Museum at Athens was also discovered here. There are numerous interesting archæological remains, chief of which are those of the Hall of the Mystœ on the site of the ancient capital near the village of Klima, and those of prehistoric Phylakopi, which were excavated by the British School at Athens from 1896 to 1899.

MELPOMENE, měl-pŏm'ę-nē, one of the Muses, daughter of Zeus and Mnemosyne. She presided over tragedy and was generally represented as a young woman with vine leaves surrounding her head, and a tragic mask covering her face.

MELROSE, Mass., city in Middlesex County, on the Boston and Maine Railroad, about eight miles north of Boston. It was settled about 1632, and until 1649 it was a part of Charlestown. It remained a part of Malden until the next year (1650), when it became a separate municipality. It was chartered as a city in 1900 and includes the villages of Fells, Wyoming and Melrose Highlands. It is a residential suburb of Boston, but has considerable manufacturing. The chief manufactures are rubber boots and shoes. There are 25 factories of all sorts, employing about 1,200 persons, with an invested capital of over $2,000,000 and annual gross products of $2,825,000. The State Reservation, Middlesex Fells, 1,800 acres, and Spot Pond, a natural reservoir, are attractive features. It has municipal waterworks and a lighting system. The government is vested in a mayor, elected annually, and a council. The subordinate officials are chosen by the mayor and council; the school board by election. Pop. 18,000. Consult Drake, 'History of Middlesex County'; Goss, E. H., 'History of Melrose' (1902).

MELROSE, Minn., city in Stearns County, on the Great Northern Railroad, 100 miles northwest of Saint Paul. It contains flour mills, granite works, planing and saw mills. The municipality owns and operates the electric-lighting plant and the water-supply system. Pop. 2,600.

MELROSE, Scotland, a village of Roxburgshire, on the south bank of the Tweed at the base of the Eildon Hills, two miles east of Abbotsford, the home of Sir Walter Scott, whose 'Lay of the Last Minstrel' gave Melrose and its ruined abbey world-wide celebrity. The village had a population of 2,166. The famous abbey, now the property of the Buccleuch family, is admitted to be the most beautiful of all the ecclesiastical ruins in Scotland. The architecture is in the late flamboyant Gothic style, and the chief remains are part of the nave, the transept, choir and the southern aisle with several chapels, of the abbey church and fragments of the cloister. The church originally was 258 feet long, with a width at the transepts of 137 feet. It was founded by King David I in 1136, destroyed by Edward II in 1322 and rebuilt by Bruce in 1326. It is the burial place of the heart of Robert Bruce, the good Lord James Douglas and the Knight of Liddesdale. It was partly demolished by the English in 1545.

MELROSE PARK, Ill., village of Cook County, about 10 miles west of Chicago, on the Chicago and Northwestern and other railroads. It contains iron works, can factories and stone quarries, but is best known as a residential suburb of the Windy City. The water-supply system is the property of the municipality. Pop. 4,800.

MELTING POINT, the temperature at which the solid and liquid states of a body can coexist, without the fluid part of the mixture solidifying, nor the solid part melting. The melting point of a body which is crystalline in nature (like ice) is usually quite definite, and a body of this kind, when it melts, passes at once from a state of perfect solidity into a state of perfect fluidity. The melting point of an amorphous body, such as wax or pitch, is often very indefinite; and when a solid of this sort is gradually heated it grows soft and passes into the fluid state by a process which is practically (or even absolutely) continuous. The phenomena of the fusion and solidification of amorphous bodies like wax are not yet understood as well as those that attend the change of state of a crystalline body; and it is to be understood that what follows in the present article is stated with particular reference to the crystalline class of substances, in which the melting point is definite.

In general, solid bodies expand upon melting, the original solid having a greater density than the liquid that results from its fusion. In

the case of water, as is well known, the reverse is true; the fact that ice floats in water proving that the water is denser. The fact that the density of a substance changes upon fusion implies (as may be proved by the mechanical theory of heat) that the melting point of the substance cannot be entirely independent of the pressure. This fact was discovered in 1849 by James Thomson, who showed that the melting point of a substance like ice, which contracts upon melting, must be lowered by pressure; while the melting point of one which expands upon melting must be raised by pressure. These theoretical conclusions have since been abundantly verified by experiment. In the case of ice, for example, it has been found by Dewar, that the melting point is lowered by 0.0130° F. per atmosphere of increase of pressure, up to 700 atmospheres.

When a substance passes from the solid to the liquid state, it absorbs a very considerable amount of heat, which is known as the "latent heat of liquefaction"; and the liquid which is formed cannot be all reduced to the solid state again until an exactly equal quantity of heat has been abstracted from it. When heat is added to a mixture composed of a solid and its liquid (pounded ice and water, for example), it does not increase the temperature of the mixture, but merely causes a certain amount of the solid to melt. This continues so long as any of the unmelted solid remains; each addition of heat merely bringing about a corresponding amount of liquefaction, while the temperature of the mixture remains unchanged. It is only after all of the solid has melted that the further addition of heat will produce elevation of temperature. The melting points of compounds undoubtedly depend, in some manner, upon their molecular constitutions, but we have, as yet, no definite knowledge of the nature of the dependence. We know that in a homologous series of organic compounds, the melting points show a strong tendency to increase, as the molecular weights of the members of the series increase; but the change in the melting points is irregular as we proceed from member to member, and no law has yet been discovered which takes the changes fully into account. The melting point of a mixture (such as an alloy) is often lower than that of any one of the constituents, and the effect of the presence of an impurity in a given substance upon the melting point of that substance is often out of all apparent proportion to the quantity of impurity present. This fact implies that in the determination of a melting point it is highly important that the substance under examination shall be as nearly pure as possible. The presence of slight, unrecognized and apparently negligible impurities has sometimes led to entirely erroneous conclusions. In 1860, for example, Kolbe announced the discovery of an acid isomeric with benzoic acid, but having a lower melting point; but Beilstein afterward proved that the substance in question was merely ordinary benzoic acid contaminated with a quantity of chlorobenzoic acid so small as to be barely recognizable by analysis.

For determining the melting point of minerals, the instrument devised by Joly and known as the meldometer, is sometimes very convenient. It consists essentially of a strip of platinum foil, upon which small fragments of the minerals are laid. The platinum is then gradually heated by the passage of an electric current, until the mineral melts; the temperature of the foil being obtained by a calculation based upon the resistance of the platinum, the observed strength of the current and the rate at which heat is radiated from the foil, as determined by separate observations. This method is especially useful for minerals which can be had only in small fragments.

The term fusing point is often used instead of melting point, where a high temperature is required to melt. Following are the melting or fusing points of a few familiar elements in degrees F.: Mercury, 38; ice, 32; potash, 104.5; soda, 204; sulphur, 235; bismuth, 517; tin, 551; lead, 850; aluminum, 1,160; flint, 1,600; silver, 1,750; gold, 1,913; copper, 1,931; nickel, 2,642; iron, 2,912; platinum, 3,225; carbon, infusible. Alloys show vastly different melting points; thus 93 per cent bismuth with 7 per cent zinc melted at 479° F.; 44 per cent lead and 56 per cent bismuth at 253°. See FREEZING POINT.

MELTON MOWBRAY, mō'brĕ, England, an ancient market town in Leicestershire, 14 miles northeast of Leicester, on the right bank of the Wreak, at the junction of the Eye, 105 miles north by west of London. Melton Mowbray is famous for its pork pies and Stilton cheese. It owes its prosperity chiefly to being the seat of the Melton Hunt, which attracts the sporting world in great numbers during the winter months, extensive and luxurious hunting establishments being maintained here. Pop. (urban district) about 8,000.

MELTZER, Charles Henry, Anglo-American playwright and journalist: b. London, England, 7 June 1853. He was educated in London and Paris, where he became correspondent of the Chicago *Tribune* and later of the New York *Herald,* for which paper he traveled over Europe and Egypt. In 1888 he was appointed dramatic and musical critic of the New York *Herald,* holding that position for four seasons. From 1893 to 1896 he was dramatic reviewer of the New York *World,* also for seven years New York correspondent of the London *Daily Chronicle.* His experience was utilized as literary associate in connection with a course of modern plays at Carnegie Lyceum, New York, and in Washington, Boston and elsewhere. In 1907 he became musical critic and special writer, in the United States and abroad, of the New York *American* and the *Cosmopolitan Magazine.* In 1914 he was appointed dramatic critic, New York *American.* Among his plays are 'The Story of Rodion the Student' (original, founded on Dostoievsky, novel); 'Manon Lescaut' (original, founded on the romance of Abbé Prévost); 'The First Duchess of Marlborough' (original, historic comedy); besides English versions of 'Hannele' (Hauptmann); 'Mme. Sans Gêne' (Sardou and Moreau); 'L'Arlesienne' (Daudet); 'The Sunken Bell' (Hauptmann); and a farce, 'His Honor the Mayor' (with A. E. Lancaster). From 1902 to 1907 he was secretary and librettist to the management of the Metropolitan Opera Company. He has made English versions of 'Das Rheingold'; 'Die Walküre'; 'Königskinder'; 'Les Contes d'Hoffmann'; 'Das Heimchen am Herd'; and 'Orfeo' (Monteverde).

MELTZER, Samuel James, American physiologist: b. Russia, 22 March 1851. He

received a general education at Königsberg, Prussia; studied philosophy and medicine at the University of Berlin 1875–82 and removed to the United States in 1883 since when he has practised his profession in New York. Since 1906 Dr. Meltzer has been head of the department of physiology and pharmacology at the Rockefeller Institute for Medical Research and consulting physician at Harlem Hospital. In 1917 he was commissioned major in the Medical Reserve Corps. Dr. Melzer is a member of many medical and surgical societies. He is the author of over 200 papers on biology, physiology, scientific medicine, etc.

MELUSINA, měl-oo-sī'na, or **MELUSINE,** in French myths, a beautiful nymph or fairy, who is represented as the daughter of Helmas, king of Albania, and the fairy Persine; and as having married Raymond, Count of Toulouse, who built the magnificent castle of Lusignan. Like most of the fairies of that period, she was doomed to a periodical metamorphosis during which the lower part of her body assumed the form of a fish or serpent. On these occasions she exerted all her ingenuity to escape observation; but having been once accidentally seen by her husband in this condition, she swooned away, and soon afterward disappeared. Her form is said to be seen from time to time on the tower of Lusignan, clad in mourning and uttering deep lamentations. Her appearance was believed to indicate an impending calamity to the royal family.

MELVILLE, měl'vĭl, or **MELVILL, Andrew,** Scottish reformer: b. Baldovie, near Montrose, Forfarshire, 1 Aug. 1545; d. 1622. He was educated at the grammar school of Montrose and the University of Saint Andrews; studied two years (1564–66) at the University of Paris; went to Poitiers to pursue his studies in the law; there became regent in the College of Saint Marceon; and through the influence of Beza received an appointment to the chair of humanity in the academy of Geneva. Returning to Scotland in 1574, he was at once appointed principal of the University of Glasgow, and in 1580 was made principal of Saint Mary's College, Saint Andrews. In 1582 he presented a petition to King James against the undue interference of the court in ecclesiastical affairs, for which he escaped imprisonment by going into England. Returning in 1585, he resumed his duties at Saint Andrews, and was moderator of the General Assembly in 1587, 1589, 1594. In 1606 he was summoned to London by the king to confer on Church matters, but because of his outspokenness he was committed to the Tower, and there remained until 1611. He was then released upon the solicitation of the Duke of Bouillon, retired to France and became professor in the university at Sedan, which, according to some accounts (others say London), was the place of his death. Consult 'Lives' by McCrie (1819); Morrison (1900).

MELVILLE, Sir **George,** British administrator: b. Aberdeen, Scotland, 1 July 1842. He was educated by private tutors and at Edinburgh Academy. He entered the imperial service in 1862; and was employed in the colonial civil service from 1874–1905. Between 1899 and 1903 he acted successively as administrator of British Honduras, the Falkland, Bahamas and Leeward islands, Saint Lucia and Windward Islands. He was created K.C.M.G. in 1900.

MELVILLE, George Wallace, American naval engineer: b. New York, 10 Jan. 1841; d. 17 March 1912. Educated Brooklyn Polytechnic; entered the navy as assistant engineer 1861; served through the war; and in 1879 accompanied the De Long expedition on the *Jeannette* to discover the northeast passage. Of this party he was one of the few survivors; most of the others owed their lives to his indomitable courage and herculean strength — he carried a brother officer, weighing 175 pounds, upon his back, through ice and snow, at the same time superintending all movements of the crew and on occasion helping with the boat. He also commanded the subsequent search expeditions which recovered the *Jeannette's* records and De Long's body. In 1887 he was made chief engineer of the navy, a post from which he retired in August 1903, having entirely reformed the service, put navy engineers on a professional rather than an artisan footing, introduced the triple screw on such successful ships as the *Columbia* and *Minneapolis*, saved the department a tremendous sum by his refusal to adopt a boiler which had proved unsatisfactory in the British navy and designed 120 ships of over 700,000 horse power. Melville was made rear-admiral in 1899, and retired in 1903. His book, 'In the Lena Delta' (1885), describes his experiences in the *Jeannette* expedition.

MELVILLE, Herman, American novelist: b. New York, 1 Aug. 1819; d. there, 28 Sept. 1891. His grandfather was the original of Holmes' 'Last Leaf.' His father, an importing merchant, died when Herman was a boy, and in 1837 his education in the Albany Classical School and in New York City having been completed, he shipped as a cabin boy. Then he taught school for several years, but in 1841 sailed on a New Bedford whaler, from which in 1842 he made his escape with a comrade on one of the Marquesas. His experiences among the warlike natives and his rescue by an Australian whaler are described in 'Typee, a Peep at Polynesian Life' (1846), a great success and an excellent portrayal of life in the South Seas. In 1847 he married the daughter of Justice Lemuel Shaw of Massachusetts; from 1850 to 1863 lived in Pittsfield; was employed in the New York custom-house from 1866 to 1885; and then retired because of ill-health. Melville's writings apart from a few small volumes of verse are mostly taken up with the life of the sailor; some of his better known titles are 'Omoo, Adventures in the South Seas' (1847); 'White Jacket, or the World in a Man-of-War' (1850), which effected the abolition of flogging in the United States navy; 'Moby Dick, or the White Whale' (1851), and 'Pierre, or the Ambiguities' (1852). These stories were justly popular. Several "philosophical romances" met with little success. 'Battle Pieces, and Aspects of the War' (1866) is Melville's best verse. His four best romances of the sea were re-edited in 1892. See Moby Dick.

MELVILLE ISLAND, (1) an uninhabited island of the Arctic regions crossed by lat. 75° N., long. 110° W., and separated on the

west by Fitzwilliam Strait from Prince Patrick Island. Its greatest length is 200 miles; greatest breadth 130 miles. It lies north of Melville Sound, and was discovered in 1819 by Parry, who gave the island its name and wintered there. The formation is mainly sandstone with lime and coal beds. It was visited by Bernier in 1908. (2) An island at the entrance to Van Diemen Gulf, off the shore of the Northern Territory of Australia, with an area of about 1,800 square miles. It is hilly and densely wooded, especially with several species of eucalyptus. The earliest British settlement was made in 1824.

MELVILLE PENINSULA, North America, a northeastern projection of Keewatin in the Northeast Territories of Canada, about 400 miles north of Hudson Bay. Bounded on the north by Fury and Hecla Strait and on the east by Fox Channel. It is about 250 miles long by about 100 miles broad.

MELVILLE SOUND, North America, a channel about 250 miles long by 200 miles broad, extending southeast of Melville Island, and communicating with the Arctic Ocean on the west by Banks' Strait, and with Baffin Bay on the east by Barrow Strait and Lancaster Sound. Much of its contour was measured by Hansen in 1903.

MEMBER, a subdivision of a formation (q.v.) not usually considered of sufficient importance to map separately, but given a separate description or mention in the text of a report.

MEMBRANE, *in anatomy and physiology,* a thin sheet-like tissue, more or less elastic, varying in structure and vital properties. Membranes absorb or secrete fluids, connect certain parts of the body, separate, envelop or form certain organs or act as partitions between two fluids or gases, permitting them to mingle. Mucous membranes line the canals, cavities and hollow organs which communicate externally by different apertures on the skin; for example, the digestive, respiratory and genito-urinary tracts. These membranes are soft and velvety and have on their free surface cells for absorption or motion and in their substance follicles which secrete mucus for lubricating and other purposes. Such secretions are saliva, gastric juice and pancreatic juice. Serous membrances, such as the peritoneum, pleura, the unicæ vaginales and pericardium, facilitate the motion of the organs they envelop (abdominal digestive organs, the lungs and heart) by reason of the serum they secrete, and also maintain the shape of these organs. Allied to the serous membranes are the synovial membranes lining movable joints. By reason of their smoothness and by aid of their lubricating serum the ends of bones move readily upon one another. Fibrous membranes (for example, periosteum, dura mater and perimysium), not moistened by any particular fluid, augment the solidity of organs they envelop, retain them in position, favor their motion and form canals and rings for the passage of different organs. The membranes which envelop the brain and are extended to cover the spinal cord are called meninges. (See MENINGITIS). The membranes enclosing the fetus are called the placenta (q.v.). Other special membranes are Descemet's membrane, which is the fourth layer of the cornea of the eye, and Bowman's membrane which is the second.

MEMBRE, mŏñ-brā, **Zenobius,** French missionary in America: b. Bapaume, France, 1645; d. Fort Saint Louis, Tex., 1687. He became a member of the Récollet Order; was sent as a missionary to Canada in 1675; accompanied La Salle in his western expedition; was with Tonti at Crèvecœur, where he helped bring about peace between the Iroquois and the Illinois; in 1682 went down the Mississippi with La Salle, and in the same year returned to France. For a time he was warden of a convent in his birthplace. But in 1684 he set out again with La Salle for the mouth of the Mississippi. He was left by La Salle at Fort Saint Louis and there massacred by the Indians. He wrote a description of his trip down the Mississippi, which was incorporated by his cousin, Christian le Clerq, into his 'Etablissement de la Foi dans la Nouvelle France' (1691), and which was later unscrupulously copied by Hennepin (q.v.). This narrative has sometimes been attributed to La Salle.

MEMEL, mā'mĕl, Germany, an important fortified seaport of Prussia, near the Russian frontier, at the north extremity of the Kurisches Haff, at its opening into the Baltic, 70 miles north by east of Königsberg. It was almost wholly destroyed by fire in 1854, and was rebuilt in modern style. It has a large harbor, and exports from Lithuania and Russia great quantities of timber, also flax and linseed, coal, manure, grain and herring; has also manufactures of brandy, soap and chemicals, sawmills, iron foundries, breweries and ship-building yards. Memel was founded in 1252 by the Livonian order, who gave it to the Teutonic Knights, by whom it was fortified in 1404. It suffered severely in the Lithuanian wars (13th and 15th centuries). Here in 1807 Frederick William III of Prussia took refuge and a treaty with England was signed. It was seized by Russia in 1812 and again in 1914, but on each occasion they were obliged to give it up. The town gives its name locally to the Niemen River (q.v.). Pop. 21,470.

MEMLING, or **MEMLINC, Hans,** Flemish painter: b. Mainz, about 1430; d. Bruges, 1495. He settled at Bruges 1478, of which town he was a prosperous citizen until his death. While all that is handed down of his biography is apocryphal, it is evident, from his works, that he was an imitator of Roger Van der Weyden, although he avoided the harshness and ungraceful drawing of that artist's style. He stood alone among the Flemish painters of his day in the religious tenderness of his pictures, their life-like expression, their exquisite coloring and modeling. His chief works are to be found in Saint John's Hospital, Bruges, namely, the altarpiece, 'Marriage of Saint Catharine' (1479); 'Portrait of Maria Moreel as Sybilla Persica' (1480), and the 14 scenes illustrating the legend of Saint Ursula and the 11,000 Virgins of Cologne (1589). In the Academy of Bruges is a triptych of his in the central panel of which are Saints Christopher, Maurus and Ægidius, and on the wings Burgomaster Moreel (who offered the picture) with his family. In the Royal Gallery at Turin is his 'Seven Dolors of Mary'—a passion picture; in the Pinakothek at Munich a compan-

ion picture, 'The Seven Joys of Mary.' Consult Michiels, 'Memlinc, sa Vie et ses Œuvrages' (1883); Wauters, 'Sept Etudes pour Servir à l'Histoire de Hans Memlinc' (1894).

MEMMI, měm'mē, **Simone.** See MARTINI, SIMONE.

MEMMINGER, měm'mĭn-jẽr, **Christopher Gustavus,** American politician, secretary of Treasury in the Confederate government: b. Württemberg, Germany, 17 Jan. 1803; d. 7 March 1888. He was brought to America in infancy, and was educated at South Carolina College. He studied law; began to practise in Charleston in 1825; entered politics as a leader of the Union party; attacked the States' Rights party in a satire called 'The Book of Nullification' (1832); reformed the public school system of the State, and for 20 years was in the State legislature, much of the time acting as head of the finance committee. In 1859, after John Brown's raid, he was commissioned by South Carolina to consult with other delegates in Virginia as to the best method of warding off attacks of Abolitionists. From the formation of the Confederacy until June 1864 he was Secretary of Treasury, and his mistaken policy in that office did much to ruin the Confederacy financially.

MEMNON, in Greek mythology, the son of Eos (Dawn), an Ethiopian prince, nephew of Priam, for whom he fought at Troy. After he had killed Antilochus he was defeated by Achilles. The post-Homeric legend adds that his mother wept bitterly for him, even after he had been made immortal. Memnon's kingdom was localized on the west bank of the Nile, and one of the colossal statues of Amenhotep III, as early as the 1st century A.D., became connected with the myth. It was said to portray Memnon, and the musical note emitted when the sun's rays struck the statue in the early morning (probably due to the action of sudden heat on the chilled damp stone) were explained as Memnon's greeting to his mother. The statue, rehabilitated by Severus, is still sonorous. The name Memnonium was applied in the Ptolemaic period not only to the west bank of the Nile, as "Memnon's land," but to a temple near Abydus, excavated by Mariette in 1859, which contains the famous "gallery of kings." This has a list of 76 Egyptian kings, and dates from the time of Seti I and his son, Rameses II. This Memnonium contains many other important sculptured documents.

MEMOIRS OF CARLO GOLDONI ('Mémoires de Carlo Goldoni'). This work is celebrated among the many of this class in literature, and yet, in a general way, is comparatively little known. The 'Memoirs' were written in French, when Goldoni was 80 years old, and first appeared in Paris in 1787 (3 vols.). An excellent edition, reproducing them entire and accurately, was published on the second centenary of the author's birth 1907, by the Florentine firm Barbèra, edited with Italian notes by Guido Mazzoni. It was in 1760, a year before Goldoni was called to Paris, that he conceived, as he states in the preface to the 'Memoirs,' the idea of an autobiography. On seeing that the first Florentine edition of his plays had become the subject of universal pillage, no less than 15 editions having been published without his knowledge and very incorrectly, he resolved to publish a second edition at his own expense and insert in each volume a part of his life, imagining that in this way the history of his person and his plays might be completed together. Moreover, it occurred to him that possibly a collection of his works might some day be discovered in a corner of some old library and awaken curiosity to know something about the writer who undertook to reform the Italian theatre and wrote 150 comedies of character and intrigue. But as the years rolled on and the work which was to extend to 30 volumes and become completed in eight years had only reached the seventeenth volume, Goldoni realized that his project would not be completed during his life. So setting to work six years before his death, abridging and translating into French the contents of the historical prefaces of his 17 volumes of the Venice edition of the plays which related mostly his early life, and continuing with an account of the reformation of the Italian theatre, due largely to the author's theatrical genius, he completed the first part of the 'Memoirs.' The second part gives an account of the composing, construction and outcome of his many plays, together with the criticism of them and rivalry excited by them. The third and final part of the 'Memoirs' relates the author's personal experiences in France from 1762 to their close in 1787.

The 'Memoirs' of Goldoni have been called his most amusing comedy and pronounced by no less a literary light than Gibbon, "more truly dramatic than his Italian Comedies." They have been the subject of admiration of some of the most distinguished of litterateurs not only in Italy but in England, France and Germany, is proven by such testimony as that of Byron, Voltaire and Goethe. But to appreciate and enjoy Goldoni's entertaining personal reminiscences, no such extraordinary literary talent is necessary,— far from it, for the average reader can hardly fail to get enjoyment from them, especially if he be at all interested in 18th century life in Italy. As a faithful picture of the life of this period, especially the life of the humbler classes, the 'Memoirs' of Goldoni rival his plays and are unexcelled. The parts that relate to Venice, Chioggia and to life in the Italian cities where Goldoni had his many and varied youthful experiences have that genuine ring found in his best plays in Italian dialect depicting life among the common people. The portions relating to the author's life in France, although far from lacking in interest, have not the charm that the parts of the 'Memoirs' have which relate to Italy. There is an English translation of the 'Memoirs' by John Black (2 vols., London 1827). The same, abridged and edited, together with a luminous introduction by William Dean Howells (Boston 1877). For everything concerning Goldoni and his works, consult H. C. Chatfield-Taylor's masterly work 'Goldoni, a Biography' (New York 1913).

JAMES GEDDES, JR.

MEMORIAL ARCH, an arch usually built across an avenue or street, or at an entrance to a park, garden or other public place, to commemorate some person or event. The

Washington Arch in Washington Square, New York City, is a well-known American example of the memorial arch. It is built of marble and is adorned with elaborately carved figures.

MEMORIAL ARCHITECTURE. See SEPULCHRAL ARCHITECTURE.

MEMORIAL DAY. See DECORATION DAY.

MEMORY IN ANIMALS is to be studied in the light of comparative psychology, as between the human and the animal mind. To one class of thinkers this difference seems only one of degree; the mind of the animal to them is of the same nature as that of man, but is less developed by reason of limited experience, lack of stimulus because of comparatively small means of intercommunication of ideas, and general inferiority in complexity of brain structure. To another class of thinkers there is an essential difference — a permanent gulf between the mental processes and powers of brute and human beings. Memory is one of the most important attributes of mind and must vary with varying mental abilities. Thus it is hardly, if at all, perceivable in animals of low organization, but is more and more recognizable as we ascend the scale of animal organization, until at the top its operation is clearly visible. In studying it as regards animals we are met, however, with this initial and constant difficulty, that while we are able not only to question ourselves and report what we find for comparison with and discussion of the self-examination by other men, we cannot see into an animal's mind and must judge of its processes by their outward signs. Thus we may assure each other that we possess imagination, which is a high function of memory; but how are we to discover whether an animal indulges itself in such a mental exercise? When a horse goes slowly and with hanging head on an outward journey but becomes instantly animated and brisk in his gait when he is turned toward home, is that because he pictures in his mind the comfortable stable and good food awaiting him? If so, is that not an example of imagination? It has been customary to attribute all such acts as nest-building and the like to "instinct," but innumerable examples of both faulty and beneficial work of this kind discourage faith in so simple a solution; and when a bee ingeniously stays a falling comb by a new brace or guy of wax, or a beaver overcomes a change in his pond by altering the direction of his dam or by building another in a new place, must these creatures not exercise imagination in order to plan and carry out the new way of meeting an unexpected difficulty? Each is applying his experience, recalled by memory, in the way he pictures (must picture) to himself the result of what he purposes to do, or he could not carry out his intention. That the animals we know best, horses, dogs, cats and so forth, have a very retentive memory, at least in certain directions, every one knows. The theory of many students of the matter is that this is purely "associative," that something they see or smell or hear recalls a group of facts connected with it; and that it is impossible for them to recall this group without such a concrete suggestion. Much evidence may be produced throwing doubt on this limitation of their power.

ERNEST INGERSOLL.

MEMORY AND ITS DISORDERS. Locke has defined memory as "the power the mind has to revive perceptions which it once had, with the additional perception that it has had them before." Ribot distinguishes three functions of memory: (1) the preservation of certain states, (2) their reproduction and (3) their recognition. In view of the fact that the collection of gray matter in the cerebro-spinal axis below the cortex is capable of storing impressions and that probably all parts of the sensory nervous system are concerned in mind action and in memory, it will be necessary to speak not merely of memory but of memories in the sense of reproductions of like sense quality with the original impressions. Modern psychology accepts the concept of unconscious memory, which would imply that all impressions upon all sense organs are permanently retained in the organism. In this case the question is not so much how we remember as why we forget. An answer to this question has been found by the present day analytical psychology of the unconscious. Up to the time of the acceptance of these views the determinants of memory were considered to be frequency of repetition of the stimulus, or its intensity, or its interest or a combination of these factors. From a purely mechanical point of view memory is interpretable as a result of a biochemical phenomenon. The sensory nerve cells, being acted on by certain stimuli, whether of touch, taste, hearing or sight, undergo certain molecular changes. Repetition of similar impulses induces similar reactions and a habitual response in the affected cells results. A line of least resistance is established and in these habitual responses the germ of the idea of memory is to be found.

From this point of view the nerve-cells retain something as a result of a previous experience, and the repetition of the stimulus finds the cells in a receptive state. Continued repetition of the stimuli constitutes a memory, and in this sense the training of a certain mechanism has bound up in it this mechanical theory of memory. Thus a muscular effort, as in tennis, or skating, or piano-playing, becomes by repetition remembered in automatic action, frequently without consciousness. It is the usual rule that many muscular acts which in their acquisition have called for conscious memories soon become automatic, and the effort no longer rises into consciousness, perhaps because of its diminished intensity. A similar point of view may be held for sound-impressions, for taste, for touch, for sight, in each individual case a different series of nerve-cells and nerve-fibres being involved. Thus the memory for a poem may mean a habit-response to a series of sight or sound impressions, or of the muscular memories of the speech mechanism that has learned to repeat the phrases. The actor who automatically says his lines, often not conscious of what he is saying, the pianist who mechanically plays, or the golfer who unconsciously drives true, all show the same class of memory adaptations, involving different nervous chains.

There are thus not only a visual memory, but an auditory memory, or memory for sounds, a gustatory memory for tastes, an olfactory for smells, and special memories for the other special classes of sensation. Older psychology

was concerned with the question as to the fidelity and longevity of these special memories or types of memory, as related to each other, and with the discovery of laws according to which they might be revived. (See MNEMONICS). But with the introduction of the unconscious as a dynamic factor, the recalling of a previous experience is explained on a new principle. Memories are thus seen in the form of ideas to be reproduced into consciousness by virtue of forces which are mainly unconscious, and over which consciousness has only an indirect control, and the study of memory as such retires to an importance secondary to the study of the causes why some things tend to be remembered and others tend to be forgotten. This trend or tendency on the one hand to be forgotten or on the other to be remembered is now known to be determined by the unconscious wish, a force which is termed the *libido* and which is the prime mover, although uniformly unrecognized, of all the activities of the ego, both conscious and unconscious.

The mental mechanisms by which the unconscious pervades and indirectly controls all the conscious expressions, whether activities or thoughts, will be discussed under the title PSYCHOANALYSIS. In connection with memory it is necessary here only to point out that what we remember is only the residua after the work accomplished by the processes of repression, during which most of our former experiences are forgotten. On the fundamental principle that what is unpleasant in experience is from earliest infancy rejected by the individual ego, and regarded as if it did not exist, we may regard the ego as similarly rejecting or repressing the memories of impressions associated with the unpleasant or painful incidents. This explains why some things are forgotten and others are remembered. The unconscious, which functions solely on the principle of accepting or striving for the pleasurable and rejecting or repressing the painful, therefore furnishes the motive force for injecting certain ideas into consciousness, and restraining other ideas from entering. On this fact depends the further phenomenon that the dynamic factor called the libido, in becoming attached to certain ideas which are thrust out of consciousness, may be *converted* and its force applied to vegetative functions of the body producing in many cases certain forms of disease. See PSYCHOTHERAPY.

Memory, however, does not depend on repetition of stimulus alone. There are variations in intensity and duration of stimuli, modifications in plasticity of the nerve-cells themselves, the quality of attention, and above all the native individual character of health of the nerve-tissue itself—all of which factors enter into the everyday variations in memory that are familiar to all. The fixity and enduring quality of the memories of childhood are proverbial, and are due to the great plasticity of the youthful nerve-cells, as well as to the intensity of the early pictures. That one person should have a good visual memory and a poor auditory memory, and vice-versa, must naturally be interpreted as due to variations in individual capacity. Modern pedagogy has slowly recognized these variations, and the greater prominence given to play, and to methods of precision, be they manual, lingual, auditorial or visual, and less to distinctly formal methods of memorizing as a purely visual process from a printed page, may be regarded as evidence of this wider recognition that memory should be a generalized function, and not a pedantic cramming of any sort. A well-trained muscular system may be of far greater use to a man than any of his acquired knowledge. It is impossible to train certain children to do certain things, whereas in other directions training may result in great proficiency.

Disorders of Memory.— The classifications of disorders of memory into those of defect and those of excess is based on the old psychology which laid most of the defects to lesions in the cortex of the brain. The newer view, while admitting the loss of memory evinced by the physical defect in the brain or nerve substance, admits also a purely functional deficiency in various memories which is determined by the unconscious wish and is entirely independent of any organic lesion or defect. It is agreed by most psychologists that the native retentiveness in any given individual does not itself alter, although there may be in one individual a finer nerve and brain structure than in another, enabling one to perceive and therefore retain finer distinctions. But the ability to recall at will, which is the essential quality of a good memory in the ordinary sense, is dependent solely upon the proper alignment of the unconscious wish with the desires of the conscious life, which are determined by the social environment of the individual.

The general term for deficiency or loss of memory is amnesia, although this term fails to express the various distortions of memory, the illusions or slight absences; and there are no technical words to distinguish temporary or permanent, periodic or progressive stages of the amnesic process. Inasmuch as memory is not one thing, but a great assemblage of processes which reflect a vast variety of psychological functions, situated not in the brain alone, but almost anywhere in the nervous system, a "defect in memory," as defined by Jastrow, "is an expression of the incapacity of a group (or of certain groups) of centres to exercise their normal functions; or a tendency which they show to functionate in an abnormal manner." Defects of memory may be general or special. General defects may be due to an incapacity on the part of nervous centres to establish residua. This type is found in those people who never remember what they see, and, notwithstanding frequent repetition of an act, never acquire proficiency in it. Occasionally a reverse general condition is manifest wherein the power of memory is unduly exalted and impressions of past experience reappear with unusual brilliancy. Such states are known in fevers, in intoxications of various kinds as of alcohol, opium, etc., and in the hypnotic trance. Special defects may arise in which particular isolated experiences are cut out of the mind. Thus alcoholic amnesia, that may forget even a committed crime, is an illustration. Somnambulism and other hysterical states are characterized by defects of this special type. Another form of defect is observed when associated memory-groups are blotted out, as in the special disorder aphasia. (See APHASIA; SPEECH, DEFECTS OF). Memory may be falsely localized in time, or in order; imaginary additions to

real events may be present; or illusory remembrances of what has never been experienced occur. Disorders of memory are never primary conditions but depend upon either the physical nerve or brain defect for which there must always be a corresponding deficiency in memory or upon the psychological conditions referred to above, where the specific memories are inhibited by associations with unpleasant or painful situations. Through the technique of psychoanalysis a great amount of forgotten material can be restored to memory by means of living over again the situations in which occurred the events responsible for the apparent obliteration of the memory.

Psychologically considered, memory defects may occur either in the storing or retentive part of the nerve-cells, or they may involve the much more complicated and associated process of reproduction of the retained images. Both processes may be involved at the same time. In imbecility, idiocy, dementia, etc., a born or acquired loss of retentive power is present. In pianists — for example, Paderewski — or chess-players — Morphy, Pillsbury, etc., a state of localized hyperamnesia is present. This group would include all such prodigies. Occasionally one sees these two groups represented in one individual, as in an imbecile who has great power for mathematical calculation, etc. A case of this kind proves that the old assumption of closely localized memory-centres is false. Memory may be said to reside in all parts of the sensory nervous system. In another group the ordinary amnesias may be placed. These vary with each individual and depend largely on the healthy tone of the nervous system. A third group would include the paramnesias, or illusions of memory. In this condition (1) there is a loss of distinction between memory of things which really did happen and an imagination of things which never did or could. The so-called "constitutional liar" is an example of this inability to distinguish between real and imaginary, and many types of insane persons are similarly affected in an extreme degree. The reverse of taking an imagination for a real thing is (2) taking a real thing experienced for the first time as a memory of something experienced before — thought of having seen, heard or felt "just that same thing before," also called "deja vue." Such a feeling has nothing to do with native retentiveness, but only with the "feeling of familiarity," which is essentially the presence of an organic sensation which is absent in the simple paramnesia. In some insanities this form of double memory is very prominent and leads to the belief on the part of the person so affected that he is prophesying when he is only recalling what he experienced before. (3) There is also an associated paramnesia in which things actually experienced suggest ideas falsely taken as memories of other things never experienced. This condition is seen in children and often leads to false testimony. It is also responsible for most "presentiments" or alleged antecedent knowledge of what has happened. Examples of such memories of the actually non-existent are seen in the stories of faith cures, where all the healing is that of ills that never really existed, save as associated false memories. On these false memories is erected much of the complicated structure of spiritualism, second sight and other similar phenomena. See IDIOCY; PERSONALITY AND ITS DISORDERS; SPEECH, DEFECTS OF; and RETENTIVENESS.

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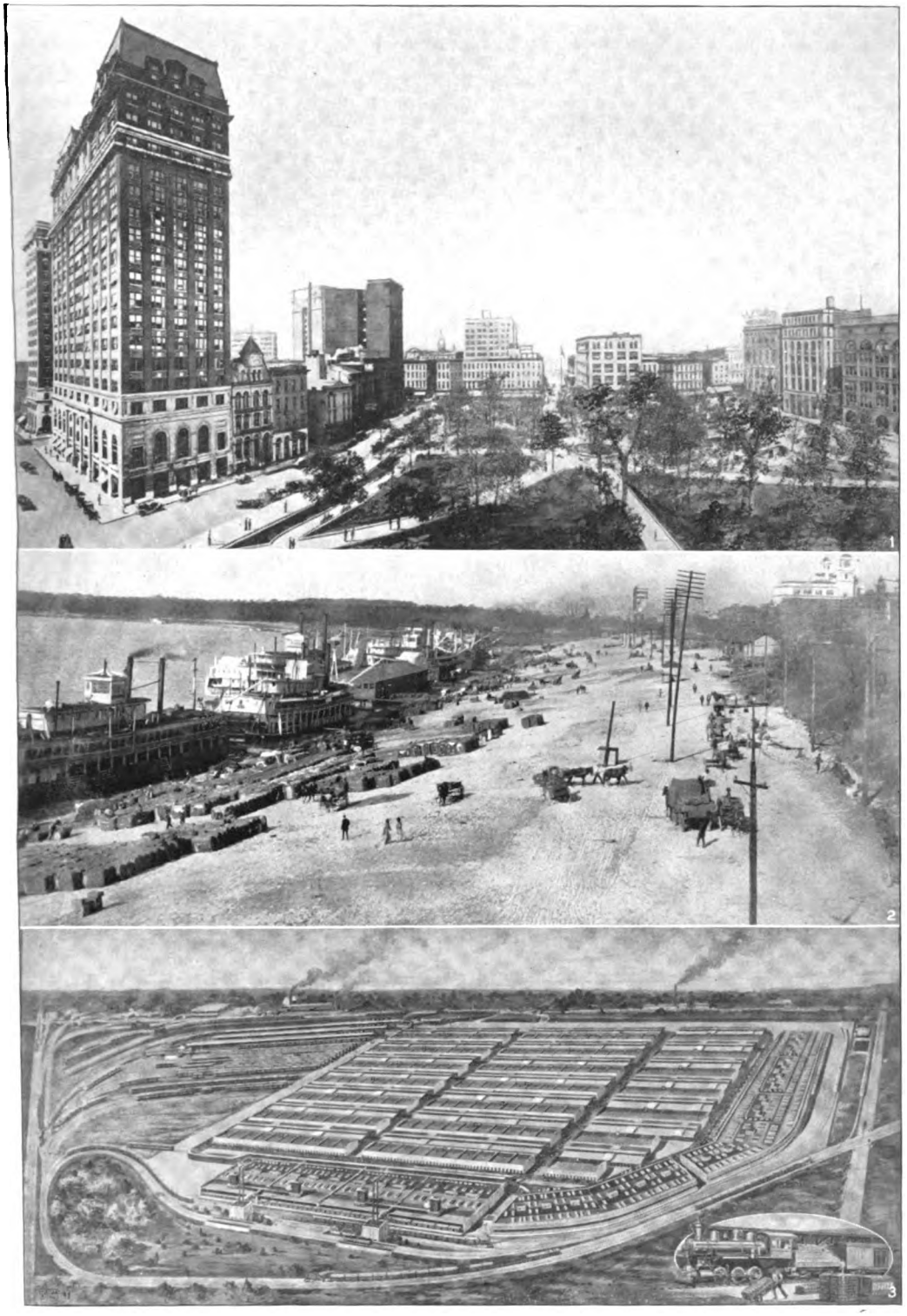
SMITH ELY JELLIFFE, M.D.

MEMPHIS, mĕm'fĭs, Egypt, an ancient city near the apex of the Nile Delta, 12 miles south of Cairo, according to Herodotus, founded by Menes, the first king of Egypt. It was a large, rich and splendid city, and the second capital of Egypt. After the fall of Thebes it became the sole capital. Among its buildings the temples of Ptah, Osiris, Serapis, etc., and its palaces were described as remarkable. At the time of the conquest of Egypt by Cambyses (524 B.C.) it was the chief commercial centre of the country and was connected by canals with the Lakes of Mœris and Mareotis. With the rise of Alexandria the importance of Memphis declined, and it was finally destroyed by the Arabs in the 7th century. In Strabo's time (20 A.D.) it was, in population and size, next to Alexandria; in biblical history it is mentioned as Moph and Noph. The name Memphis is a corruption of Men-nofer, "good abode." Edrisi, in the 12th century, describes its remains as extant in his time. Among the works specified by him are a monolithic temple of granite 13½ feet high, 12 long and 7 broad, entirely covered within and without with inscriptions, and statues of great beauty and dimensions, one of which was 45 feet high, of a single block of red granite. These ruins then extended about nine miles in every direction, but the destruction has since been so great, chiefly for the construction of Fostat, an Arabic city on the opposite bank of the Nile, that although Pococke and Bruce fixed upon the village of Mitrahineh as the site (where prone on a mound are two colossal statues of Rameses II), this was not accurately ascertained until the French expedition to Egypt, when the discoveries of numerous heaps of rubbish, of blocks of granite covered with hieroglyphics and sculpture, and of colossal fragments scattered over a space of three leagues in circumference, decided the matter. The views of the great temple of Ptah, the palace of Apis, the sepulchre of the Apis bulls, portions of the White Wall and of pyramids have been identified. Consult Petrie and Walker (in 'Publications,' Egyptian Research Account, London 1908).

MEMPHIS, Mo., city, county-seat of Scotland County, on the Keokuk and Western Railroad, about 160 miles north by west of Saint Louis. It is in an agricultural region, and is the trade centre for a large part of Scotland and adjacent counties. The principal outgoing shipments are farm products and live-stock. There are bituminous coal fields in the vicinity. Pop. 2,400.

MEMPHIS, Tenn., city, county-seat of Shelby County, on the Mississippi River, at the

MEMPHIS, TENN.



1 Court Square, showing Exchange Building 2 Down on the Levee
3 Memphis Terminal Corporation Plant, covering an area of 170 acres of ground, and handling annually 1,000,000 bales of cotton

head of all-the-year-round navigation, is the largest city in Tennessee, the fifth in size of the cities on the Mississippi River and the most important commercial centre and distributing point between New Orleans and Saint Louis.

Communications.— Steamer transportation on the Mississippi River and its tributaries reaches all the river and gulf ports, connecting with New Orleans, 394 miles; Mobile, 383 miles; Galveston, 661 miles; Savannah, 665 miles; Charleston, 726 miles; Norfolk, 961 miles; New York, 1,158 miles. Ten trunk lines operating 17 railroads, with two bridges over the Mississippi River, include the Illinois Central; Frisco Railroad; Louisville and Nashville; Nashville, Chattanooga and Saint Louis; Yazoo and Mississippi Valley Railroad; Southern Railway; Missouri Pacific Railway; Saint Louis and Southwestern Railway; Mobile and Ohio Railway; and the Rock Island Railway. The principal inland cities reached by direct lines are Birmingham, 251 miles; Saint Louis, 305 miles; Louisville, 380 miles; New Orleans, 394 miles; Atlanta, 417 miles; Kansas City, 484 miles; Cincinnati, 497 miles; Chicago, 534 miles; Washington, 931 miles. The Cumberland Telephone and Telegraph Company (Bell System) has 18,547 telephones in Memphis served by three exchanges. There are a total of 133 long distance circuits connected with the Memphis exchange, and subscribers are connected with the lines of the Bell System, which covers the entire United States and Canada.

Topographical Conditions.— Memphis is located in the most rapidly developing agricultural section of the country. It is the trade centre from the famous Mississippi Delta, and Saint Francis Basin, the combined area of which is in excess of some of the Eastern States. It is the home of the first successful Farm Development Bureau, which is doing great work in bringing about diversification of crops. The Memphis territory is no longer a one crop country. It now not only grows cotton successfully as before but most all of the other crops that are grown anywhere in the temperate zone. Suburban truck routes are operated whereby merchandise of various kinds and produce are handled between Memphis and suburban towns and farms in the Memphis district. This materially simplifies the complex national problem of handling freight on short hauls. The food conservation problem is far better taken care of in this territory, farmers not only feeding themselves but being enabled to make convenient and prompt deliveries of their farm products to the city; this being especially true in connection with dairy products, fruits and vegetables.

Industries, Commerce, Banking.— Memphis is the largest inland cotton market handling actual cotton in the world. The receipts run between 700,000 and over a million bales per year, according to the size of the crop. These receipts will be very materially increased when the opening of the 10,000,000 acres of land in the Saint Francis Basin is finished. This basin has been protected by secure levees and is being rapidly developed. As a market for short fibre cotton, such as linters and cotton hull fibre, there is no market that can compare with Memphis. There are more fibre mills in Memphis than in any other city and the trade in linters is far above the trade of any other market. Over one-half of the total crop of the country is sold through Memphis concerns. This city is the greatest centre for the manufacturing of cotton seed products in the country, including crude and refined cotton-seed oil, meal, hulls and fibre. Memphis also is the largest hardwood producing lumber market. There are in this city 28 hardwood saw mills, with an annual capacity of 370,000,000 feet; 15 lumber yards and 32 woodworking plants. Just outside of the city there are 46 hardwood mills operated by Memphis firms, the capacity of which is 500,000,000 feet. In addition there are many other hardwood mills in the timber districts surrounding Memphis, producing an amount of hardwood lumber equal to the amount manufactured by Memphis firms. Therefore, Memphis may properly be considered as the centre of a production of approximately 2,000,000,000 feet of hardwood annually. A forest products mill has been established in the city, which utilizes slabs, culls and unmerchantable timber into the manufacture of large quantities of wood alcohol and similar products. Charcoal is also produced in large quantities by this mill. The manufacture of sweet feeds is becoming an important industry in Memphis. Cotton-seed products, alfalfa and molasses are produced abundantly in this territory. This industry is being rapidly advanced by the present system of diversified farming. Foreign exports aggregate approximately $100,000,000 yearly, including three-quarter million bales of cotton and 5,000 cars of lumber.

There are 800 manufacturing industries of all kinds in Memphis and its suburbs. These include cotton-seed-oil mills, ice factories, grain elevators, wholesale grocery houses, wholesale dry goods houses, wholesale drug houses, furniture factories, woodworking establishments of all kinds, foundries, machine shops, flour mills, pulp and paper mills, fibre plants, saddlery and harness factories, potteries, car works, pump works, wagon and carriage shops, pure food products, bread, cracker and candy factories, patent medicine works, sugar plantation machinery works, barrel and skewer factories, spoke factories, golf stick works, shuttle block works, trunk, screen door and window factories, basket and box factories, egg case works, horse collar factories, engine and boiler works, electric supplies, refrigerator and cold storage machinery works, cotton gins, stove and range factories, handle and coffin factories, shaft and pole works, cider presses, distilleries and breweries. Memphis has the largest automobile wheel factory in the world. Memphis also is one of the great horse and mule markets of the world.

There are 18 commercial and savings banks in Memphis; also two industrial loan banks and two private banks. The deposits in the 18 commercial banks at the time of the last report amounted to $75,000,000. The total amount of transactions for the year 1918 amounted to $3,441,112,365. The two largest banks carry deposits of $23,500,000 and $17,000,000 respectively.

Civic Conditions.— The city is well laid out and well built. The wide, well-shaded and well-paved streets, the fine public and private buildings, the parks with numerous large trees, all make the city most attractive. The streets are paved with asphalt, vitrified brick, macadam

and gravel. There are 1,056 miles of paved roads in Shelby County. The steel cantilever bridge 1,895 feet in length across the Mississippi, costing $3,000,000, opened 12 May 1892, has been supplemented by another bridge costing $5,000,000, which combines an interurban trolley service, double railroad tracks, pedestrians' walks and a free wagon way. Memphis has 160 churches. Its superior educational advantages include three departments of the University of Tennessee, Tennessee State Normal School, Christian Brothers College, business colleges, high schools, 40 public schools, vocational schools, art galleries, libraries and museums, free endowed circulating library (Cossitt) with 15 branches; endowed (Goodwyn) Institute, with auditorium and reference library. Its free lyceum lecture course attracts the world's leading artists, thinkers, men and women of letters. Outside of the public schools, there are 19 parochial and miscellaneous schools and a number of private schools for boys and girls; coeducational, such as the University School, The Misses Hutchinson School and others.

The largest hospitals are the Baptist Memorial, the new Methodist hospital (built in 1919), Saint Joseph's, Presbyterian, Lucy Brinkley, the United States Marine Hospital and numerous small hospitals, sanitaria and homes. The Y.M.C.A. occupies its own building, which is the largest in the central South. This building is equipped with a splendid library, gymnasium, swimming pool, club-rooms, dining-rooms and all other features going with the highest class of Y.M.C.A. work. The leading theatres are the Orpheum (capacity 2,250), Lyric (capacity 1,780), Lyceum (capacity 1,400). There are numerous other show houses and film theatres in the heart of the city and in the suburbs of various capacities from 200 to 900. The leading clubs are the Tennessee, the Chickasaw, the Rex, the old Business Men's Club, which is now the Memphis Chamber of Commerce — The Memphis Chamber of Commerce continues the club features. The country clubs are The Memphis Country Club, with a membership of 450, and the Colonial Country Club with a membership of 300. The B. P. O. Elks occupy a very fine home here, centrally located. The Khaki Club for the exclusive use of soldiers is located in spacious rooms on Second street in the heart of the city, and there are numerous smaller clubs. The leading hotels in Memphis are Gaysos, 300 rooms; Peabody, 310 rooms and Chisca, 400 rooms. There are about 50 hotels in all, mostly located in the down town district — a few in the vicinity of the depots.

Parks, Public Buildings, Etc.— Memphis has 1,200 acres in improved parks, and has highly improved fair grounds containing 111 acres. Belting the city on three sides is a magnificent parkway system — the most extensive in the South. The largest park is Riverside Park on the east bank of the Mississippi River, just south of the city, containing 427 acres highly improved and a splendid specimen of landscape gardener's skill. Next to the largest is Overton Park, the finest park in the South, in the northeastern portion of the city, containing 335 acres. Within its boundaries is located the Memphis Zoological Garden which is as complete as that of Chicago, and the largest free zoological garden in the United States. Both Overton and Riverside parks have fine municipal golf links. There are several other parks scattered throughout the city. Memphis has more space in proportion to its total area in parks and parkways than any other city in the South. Adding to recreation afforded by the parks may be mentioned the Alaskan Rose Garden with a capacity of 1,500 and pleasure excursion boats up and down the Mississippi River. Notable among the city's fine buildings are the union station, the city hall and court-house, the police station, the exchange building, custom-house and post office, Goodwyn institute, Masonic temple and Scottish rite cathedral.

Modern sanitary methods obtain in Memphis, the sewer system being the Waring, the same as in New York. The water supply of the city is obtained from 64 artesian wells, the depth of which reaches 600 feet. The present pumping capacity of the water supply is 30,000,000 gallons per day, and the daily consumption is 15,000,000 gallons. Among the cities of the United States with a population of 100,000 or over, Memphis ranks second in general healthfulness. The death rate is 13.07.

History.— The history of Memphis begins almost with the history of the United States. It was a landing and tenting place for the early explorers and missionaries. It was the home of the Chickasaw Indians, and the bluffs on which the city is located, 40 feet above high water and 80 feet above low water, have always been known as the Chickasaw Bluffs. In 1698 the French built forts on the site of what is now the city, and in 1794 the Spaniards erected forts at a time when Spain was claiming exclusive right to lower Mississippi. Some of the foremost men in the United States owned lands in this vicinity and were interested in holding for their own country a right to free navigation on the Mississippi to the Gulf. Andrew Jackson, James Winchester and John Overton sent to Memphis in 1819 a small colony who established the first permanent settlement. In 1826 there were 500 persons in the settlement which was then incorporated as a town, and in 1849 a city charter was granted. The Union and Confederate forces tried to gain possession of the city at the beginning of the Civil War. On 6 June 1862 a Federal fleet under Commodore Davis conquered a Confederate fleet under Commodore Montgomery, thus placing Memphis in possession of the Union forces. General Forrest in command of Confederate forces entered the city in August 1864 and took several hundred prisoners. Memphis has always progressed commercially except during the Civil War, and when visited formerly by yellow fever epidemics. The great growth industrially has come within the last three decades. The location has made the city a great railroad centre; the surrounding forests made it a great industrial centre; and the alluvial lands of the Saint Francis Basin, Yazoo Delta and the valley of the Mississippi River will always make it a great commercial centre. In 1855 yellow fever attacked the city, and again in 1867, 1873, 1878 and 1879. The epidemics of 1878 and 1879 so paralyzed the industries of the city that in 1879 Memphis was unable to liquidate the cur-

rent indebtedness and the charter as a city was revoked. The former city was designated by the State legislature as "the taxing district of Shelby County." The control of the district was vested in a board of public works composed of five members, and a governing council composed of three commissioners. The council instituted the sewerage system, which practically eliminated the recurrence of yellow fever, improved civic conditions, liquidated the debts and in 1891 the place was reincorporated and again chartered as a city.

Population.—After the Federal census of 1890 the city limits were extended; but the population as given in 1890 included both urban and suburban districts, and the increase from 1890 to 1900 was remarkable. The growth of the city may be seen from the Federal census reports. Pop. (1850) 8,841; (1860) 22,623; (1870) 40,226; (1880) 33,592; (1890) 64,495; (1900) 102,320; (1910) 131,105; (1918) 175,000. Within a radius of 50 miles of Memphis there is a population of 800,000, according to Dun's 1917 report. The foreign born population does not amount to over 1 per cent throughout the whole territory and a careful estimate of the white race is 54 per cent and of blacks 45 per cent. Consult Davis, 'History of the City of Memphis' (1873); Keating and Vedder, 'History of the City of Memphis' (1888).

GEORGE W. FOOSHE,
Memphis Chamber of Commerce.

MEMPHIS (Tenn.), Capture of. At dusk 5 June 1862 the Union flotilla under command of Com. C. H. Davis appeared near Memphis and anchored two miles above the city. The Confederate flotilla, Com. J. E. Montgomery, commanding, was lying at the Memphis levee. At daylight the Union fleet began to drop down toward the city, and the Confederates advanced to meet it. There were no troops protecting the city. The flotillas were composed of the following vessels:

Union	Guns	Confederate	Guns
Benton	16	Little Rebel	2
Louisville	13	Bragg	3
Carondelet	13	Beauregard	4
Cairo	13	Price	4
Saint Louis	13	Sumter	5
Queen of the West	ram	Lovell	4
Switzerland	ram	Thompson	4
Monarch	ram	Van Dorn	4
Lancaster	ram		
	68		28

Besides having more than twice the number of guns, the Union ordnance was much superior to that of the Confederates. The latter, however, made a desperate fight, which finally ended 10 miles below the city, with the result that the *Lovell, Beauregard* and *Thompson* were destroyed; and the *Little Rebel, Price, Sumter* and *Bragg* captured. The *Van Dorn* escaped. On the Union side only the *Queen of the West* was disabled.

Immediately after the fight the mayor, in reply to a summons to surrender, informed Commodore Davis that there were no troops with which to oppose him. The next morning detachments from troops under Col. C. N. Fitch, which accompanied the fleet, landed and took possession of the city.

General Grant arrived at Memphis 23 June and established the headquarters of the District of West Tennessee. He was recalled to Corinth 15 July and General Sherman was ordered to Memphis, reaching the city 21 July. He restored the mayor and the city government, and made them responsible for civil order. He continued in command at Memphis until his forces left to join General Grant in the final campaign for Vicksburg, having previously participated in the first move against that city.

The raid of Gen. N. B. Forrest, of Confederate cavalry fame, into Memphis occurred 21 Aug. 1864. The Union forces and commanding officers were completely surprised and barely escaped capture. Gen. C. C. Washburn, in command of the District of West Tennessee; Gen. R. P. Buckland of the District of Memphis, and Gen. S. A. Hurlbut were asleep in the city. General Forrest left the vicinity of Oxford 18 August, with three brigades, making a forced march of nearly 100 miles. A strong detachment rode into the city at 4 o'clock in the morning, running over a regiment of 100-days men on picket, and capturing about 250 of them. This force divided into three and at once surrounded the quarters of the three officers named. Each, however, escaped. General Buckland succeeded in reaching his troops and promptly directing offensive operations. With the exception of inconsiderable skirmishes in its vicinity, Memphis thereafter remained in undisturbed Union control.

MEMPHREMAGOG, mĕm-frĕ-mā'gŏg, a lake in the southern part of the province of Quebec, Canada, extending into Orleans County, in Vermont. It is about 30 miles long, north and south, and from three-quarters of a mile to three miles wide. It is irregular in shape, and along its shores are several striking indentations, in some places low and in some other parts high and rocky. The land on the west shore is mountainous, the altitude of the highest points being about 2,800 feet. The outlet is the Magog River, which flows into the Saint Francis River. Along the shore are a number of villages, and in summer a steamer plies daily on the lake, connecting the chief towns and villages.

MENA, Juan de, Spanish poet: b. Cordova, Spain, about 1411; d. 1456. He was educated at Salamanca and at Rome and afterward was appointed secretary and court historian to John II, king of Castile. His allegorical poems, 'Coplas de los Siete Pecados Mortales,' 'Le Coronacion,' and 'El Laberinto' (The Labyrinth), a poem founded on the 'Divina Commedia' and published in the year 1496, all show the influence of Dante, for whom he held great respect and admiration. They were very popular, but possessed little literary merit. His collected works were published in 1528, entitled 'Copilación de todas las obras de Juan de Mena.'

MENA, Ark., city and county-seat of Polk County, 85 miles south of Fort Smith, on the Kansas City Southern Railroad. It is the seat of Saint Joseph's Academy, contains a public library, a splendid park and is also of good repute as a summer resort. The lumber industry is the city's largest interest, although there is a good trade in cotton and fruit. The water-

works are the property of the municipality. Pop. 3,953.

MENABREA, Luigi Federigo, COUNT, Italian soldier and statesman: b. Chambéry, in Savoy, 4 Sept. 1809; d. there, 25 May 1896. After completing a course in mathematics at the University of Turin and joining the engineers in the Sardinian army, he accepted the professorship of technical science at the military academy and at the University of Turin. Having been promoted to the rank of captain, he was used in the diplomatic corps for some time; was then elected deputy, serving both under the Minister of War and the Minister of the Interior; and upon the outbreak of the war of Sardinia and France against Austria in 1859 he was appointed chief of the engineer corps. After Savoy was ceded to France, Menabrea was made a senator by Victor Emmanuel, and chief of the department of engineers, and as such planned the fortifications of Bologna, Piacenza and Pavia; in 1860 he was created a lieutenant-general, in that year laying siege to and after three months of fighting taking Gæta. In 1861 he joined the Cabinet of Ricasoli as Minister of Marine, in 1862 also taking over the portfolio of Minister of Public Works. In 1866 he was Italian ambassador to the council which brought about the Treaty of Prague and ceded Venice to Italy. In 1867, when Rattazzi resigned, he formed a new ministry, himself becoming Minister of Foreign Affairs. As Premier he did much to place Italy in cordial relations with the outside world, and to settle internal dissensions, but his imprisonment of Garibaldi and the prevalent financial straits of the nation lost to him the confidence of the House of Deputies, and on 16 Nov. 1869 he resigned. In 1870 he became Italian Ambassador at Vienna, was appointed to the same post at London in 1876 and in 1882 went to Paris, where he was stationed for 10 years. The most important of his works are 'Etudes sur la série de Lagrange' (Turin 1844–47); 'Le genie italian dans la campagne d'Ancone et de la Basse-Italie' (Paris 1866), and 'République et Monarchie dans l'état actuel de la France' (1871).

MENAGE, Gilles, French philologist and satirist: b. Angers, 15 Aug. 1613; d. Paris, 23 July 1692. After completing his early studies he became an advocate, practising for some time at Paris, but, having conceived a profound disgust for that profession and all its adherents, he became an ecclesiastic, and for some time was a member of the household of the Cardinal de Retz, but subsequently took up his residence in the cloister of Notre Dame. A witty satire, entitled 'Requéte des Dictionnaires,' published shortly after this time and aimed at the 'Dictionary' of the French Academy, prevented his becoming a member of that society. His most important works are 'Dictionnaire étymologique, ou Origines de la Langue Française' (1650–94); 'Origines de la Langue Italienne' (1669); 'Miscellanea'; 'Remarques sur la Langue Française'; 'Historia Mulierum Philosophorum'; 'Poésies Latines, Italiennes, Grecques, et Françaises,' and 'Anti-Baillet.'

MENAGERIE, a collection of wild animals, exhibited in zoological gardens, in museums and by circus companies traveling from city to city. The term is now confined almost wholly to a collection exhibited in connection with a traveling circus, a permanent collection being styled a zoological park or "zoo." The menagerie of the typical circus is usually shown in a separate tent, so arranged that the public can make the round of the cages before taking their seats. The principal exhibits are usually elephants, a giraffe (when one is to be had), hippopotamus, rhinoceros, tapir, lions, tigers, bears, leopards (and others of the cat family), lynx, kangaroo, varieties of deer, monkeys, a few cages of snakes, and minor animals. See CIRCUS; ZOOLOGICAL GARDENS.

MENAI (mĕn'ī) **STRAIT,** the channel between Wales and the island of Anglesey, is 13 miles long, and varies in width from 250 yards to two miles. A suspension bridge and the celebrated Britannia Tubular Bridge connect Anglesey with the mainland. The tides and current are very strong at times, so that large vessels avoid the strait. See BRIDGE.

MENAM, mā-nām', or **MEINAM,** the chief river of Siam, rising in the Laos country, and flowing generally southward to enter the Gulf of Siam below Bangkok. The headwaters are named the Nam Nan. Its length is about 900 miles, and for a considerable portion of its course it is navigable for small craft. It is subject to periodical overflows on which the crops of the rice fields along its banks are dependent.

MENANDER, the name of two Greek writers, (1) the comic dramatist: b. Athens, 342 B.C.; d. there, 290 B.C. He was the pupil of Theophratus, himself the pupil and successor of Aristotle as head of the Peripatetics, and author of 'Characteres,' a somewhat more literary and popular enlargement of some ruling ideas of the Nicomachæan Ethics; he was by such a teacher well trained for his dramatic vocation. He was, moreover, a friend of Epicurus from early life, and may thus have been imbued with that bonhommie which rendered him so genial an interpreter of manners. He wrote a hundred comedies which are distinguished from those of Aristophanes by their refinement, their freedom from personal and political virulence, and their graceful, sometimes beautiful, delineation of feminine character. He was, however, outrivaled in popular favor by his contemporary Philemon, whose ribaldry was irresistible to the Athenian playgoers. Only some fragments of his works survive in the original, the most important of these relics having come to light in Egypt (1898). He was, however, closely imitated by Plautus and Terence, and in the 'Bacchides,' 'Stichus' and 'Poenulus' of the former, and the 'Andria,' 'Eunuchus,' 'Heautontimorumenos' and 'Adelphi' of the latter we have very good representatives of the Greek dramatist's method and spirit. A fine antique statue of Menander is to be seen in the Vatican. (2) A Greek rhetorician who flourished in the latter half of the 3d century B.C. He has left the rhetorical treatise 'De Encomiis,' and from his analyses of the orations of Demosthenes most of the scholia on that orator have been compiled. Consult (on Menander the dramatist), Guizot, 'Ménandre' 1855); Horkel, 'Lebensweisheit des Komikers Menander' (1857); (on Menander the rhetorician), Ritschl,

'Der Rhetor Menander und die Scholien zu Demosthenes' (1883).

MENANT, Joachim, French Assyriologist and jurist: b. Cherbourg, 16 April 1820; d. Paris, 30 Aug. 1899. Having studied law he was appointed to the magistracy of the civic tribunal in the city of Havre, but soon turned his attention to deciphering the old Assyrian inscriptions, for which he was elected a member of the Académie des Inscriptions. Chief among his works are 'Zoroastre' (1844); 'Recueil d'Alphabets des Écritures cunéiformes' (1860); 'Eléments d'Epigraphie assyrienne' (1860); 'Inscriptions assyriennes des briques de Babylone' (1860); 'Inscriptions de Hammourabi, roi de Babylone au XVI siècle avant notre ère' (1863); 'Exposé des Éléments de la Grammaire Assyrienne' (1868); 'Leçons d'épigraphie assyrienne profesées aux libres de la Sorbonne' (1873); a collection of texts, 'Annales des rois d'Assyrie' (1874), and 'Babylone et la Chaldée' (1875); 'Manuel de la langue assyrienne' (1880).

MÉNARD, mā-nār, **Michel Branamour,** American pioneer: b. Laprairie, Lower Canada, 1805; d. 1856. He was of French parentage, and after working some time for a Detroit fur-trading company entered the service of his uncle, also a fur-trader, in Missouri. The Shawnees made him their chief, and he acquired great power among various Indian tribes. Soon after 1830 he went to Texas, where he continued fur-trading with the Indians, and also dealt with Mexicans. When the Texans revolted against Mexico he held the Indians in check and kept them from acting against the insurgents. As a member of the convention at which the Texans declared their independence, and afterward of the Congress of Texas, he exerted an influence in the formation of that State. The greater part of the site of Galveston was included in a purchase made by him in 1836, and of that city he, more than any other man, is to be considered the founder.

MENASHA, mē-năsh'ą, Wis., city in Winnebago County, at the mouth of the Fox River, on Lake Winnebago, on the government canal of the Fox and Wisconsin River Improvement Company, and on the Chicago, Milwaukee and Saint Paul, the Saint Paul and Sault Sainte Marie, and the Chicago and Northwestern railroads, about 90 miles north by west of Milwaukee. The first permanent settlement was made in 1847 and the incorporation was in 1874. Menasha, like other places on Lake Winnebago, is a favorite summer resort. It is in an agricultural region in which the lumber interests are prominent. There is abundant water power. The chief manufactures are flour, lumber, paper, brick, machine-shop products, woodenware, furniture, leather and woolen goods. The city has good public and parish schools and a public library. Pop. 6,081.

MENASSE, mā-năs'ā, **Ben Israel,** Jewish scholar and writer: b. Lisbon, 1604; d. Middelburg, 20 Nov. 1657. He was in his 18th year rabbi of a synagogue in Amsterdam; mastered 10 languages and published numerous works on theology and hermeneutics. After the decapitation of Charles I of England he took measures to secure a repeal of the statue of Edward I, by which Jews were excluded from England. Cromwell appointed a commission to consider his petition, and in 1655 the legal restrictions were removed. Among his most notable works is 'Vindiciæ Judæorum,' which was translated into German by Mendelssohn, 1782. Consult Kayserling, 'Menasse Ben Israel' (1861).

MENCIUS, mĕn'shĭ-ŭs, the Latinized name of Meng-tse, that is, Meng the Teacher, a Chinese philosopher and recluse: b. province of Shan-Tung, about 372 B.C.; d. there, about 289 B.C. He was educated by his mother with such success that the approbation contained in the phrase "the mother of Meng" has become proverbial. Mencius was one of the greatest of the early Confucians. During his time the governments of China were oppressive, and Mencius for many years wandered about in search of a prince who would consent to govern in accordance with true and just principles. Failing to find any such, he retired to his former seclusion and spent the rest of his life in perfecting his system and training disciples. His works contain some enlightened views on man and society. He believed in the moral nature of man and had unbounded faith in the possibilities of progress under a good social and political system. He regarded all governments as from God, but at the same time he believed in the responsibility of rulers to their people and the people's right to depose or even put to death unworthy rulers. In a nation the people are the most important element, second comes the government and third the monarch. The aim of a government, according to him, should be the happiness and education of the people, and any ruler who was content to leave his subjects in ignorance and misery deserved to be deposed. The teachings of Mencius were written out by his disciples in dialogue form, under the title 'The Book of Mencius,' which has been translated into Latin by Julien (1824) and into English by Collin (1828). Consult Legge, 'Life and Works of Mencius' (1875); Faber, 'Lehrbergriff des Philosophen Mencius' (1877); Watters, 'A Guide to the Tablets in a Temple of Confucius' (1879).

MENDAITES. See NAZARENES.

MENDEANS. See NAZARENES.

MENDEL, Johann Gregory, abbot of Brünn, now known as the discoverer of the law named after him (see HEREDITY): b. Heinzendorf bei Adrau, Austrian Silesia, 22 July 1822, of peasant parents; d. 6 Jan. 1884. In 1843 he entered the Königinkloster, an Augustinian foundation in Altbrünn, as a novice; and was ordained priest in 1847. From 1851–53 he studied natural science at Vienna; and, on his return to the cloister, taught in the Realschule. About 1869 he became abbot of Brünn; and later took part in the Ultramontane movement. It was in 1854 that he began those experiments, on *Pisum,* in the cloister gardens, that, after the lapse of half a century, have brought him posthumous fame. In 1865 he contributed his now memorable paper, 'Versuche über Pflanzenhydriden,' to the Society of Naturalists of Brünn; and, in 1869, another, on *Hieracium* hybrids. After 1869 he seems to have discontinued his work in hybridizing, and died unrecognized by science. This seems inexplicable, as his researches were of a nature to commend them to his studious contemporaries, among them Darwin, who entirely missed his

contribution, even though the Brünn society exchanged with the Royal Society of London. But Mendel had the satisfaction of realizing that he had established a law in heredity as to the numerical ratios of the types developed in hybridizing — the grand fact for which we now prize his unobtrusive labors. His theories have given us the word Mendelism. He called himself a student of Kollar; and for some time he was president of the Brünn society. Since the verification of his experiments, simultaneously, in 1900, by De Vries, in Holland, Correns, in Germany, and Tschermak, in Austria, and of the translation of his paper appearing in the 'Journal of the Royal Horticultural Society of England' (1901), the literature has been full of "Mendel's Law." Consult Bateson, W., 'Mendel's Principles of Heredity' (Cambridge 1902).

MENDELEEFF, Dimitri Ivanovitch, Russian chemist: b. Tobolsk, Siberia, 7 Feb. 1834; d. Saint Petersburg, 2 Feb. 1907. He studied at the Institute of Pedagogy, Saint Petersburg, where he gave special attention to natural science; in 1856 became docent at the University of Saint Petersburg; was at Heidelberg in 1859–61, where he published his monograph 'On the Capillarity of Gases,' soon followed by 'Organic Chemistry.' In 1863 he became professor of chemistry at the Saint Petersburg Institute of Technology, and in 1866 was appointed to a similar professorship in the University of Saint Petersburg. The results of his researches on the compression of gases, which he closely pursued from 1871 to 1875, were set forth in his work 'On the Elasticity of Gases.' He was commissioned in 1876 to report upon the petroleum industry in the Caucasus regions and in Pennsylvania. His 'Aqueous Solutions' (1886), a work on experimental chemistry, has taken its place among the most important contributions to that branch of science. In 1890 his 'Tariff Elucidated' presented the protectionist views of which he had already become a well-known advocate, and which, as a member of the Council of Commerce and Industries, he actively propagated. When the Chamber of Weights and Measures was established by the Department of Finance, in 1893, he was appointed conservator of the weights and measures. His proof of the periodic law (q.v.), first presented in 'Elements of Chemistry' (1868–70), is his crowning achievement in pure science. Consult Thorpe, 'Essays in Historical Chemistry' (1894).

MENDEL'S LAW, the law of heredity discovered by Johann Gregor Mendel (q.v.) and first published in 1865 under the title "Versuche über Pflanzenhydriden" in the *Proceedings* of the Society of Natural History of Brünn, Austria. Mendel made prolonged experiments in crossing varieties of the pea (*Pisum sativum*). His paper was overlooked until attention to his remarkable results was called by De Vries in 1900; he and also Correns and Tschermak at the same time independently rediscovered Mendel's law. Mendel selected seven pairs of characters, such as the shape of the ripe seed, of the cotyledons, of the seed-pod, color of the seed-skin, length of stem, etc. Large numbers of crosses were made between peas differing in respect of one of each of these pairs of characters. It was found, says Bateson, that in each case the offspring of the cross exhibited the character of one of the parents in almost undiminished intensity, and intermediates which could not be at once referred to one or other of the parental forms were not found. "In the case of each pair of characters there is thus one which in the first cross prevails to the exclusion of the other." This prevailing character Mendel called the dominant character, and to the other he gave the name of recessive character.

This law of dominance has been found by Bateson and by Castle to apply to animals as well as plants, and thus is a most important biological law. Thus when mating occurs between two organisms, whether vegetable or animal, differing in some character, the offspring frequently all exhibit the character of one parent only, in which case that character is said to be "dominant." For example, on crossing white mice with gray mice, Castle found that the offspring are gray, that color-character being dominant. The character which is not seen in the immediate offspring is called recessive, for though unseen it is still present in the young, white in the experiment being the recessive color.

The law of dominance has its exceptions; the hybrid often possesses a character of its own, instead of the pure character of one parent, as is true in cases of complete dominance. The hybrid form often resembles a supposed ancestral condition, when it is usually regarded as a reversion. Examples are the gray hybrid mice, which are indistinguishable in appearance from the house mouse; also slate-colored pigeons resulting from crossing white with buff pigeons.

One result of Mendel's discovery is the purity of the germ-cells. As stated by Castle: "The hybrid, whatever its own character, produces ripe germ-cells which bear only the pure character of one parent or the other." To breeders Mendel's law is of great importance because, as remarked by Castle, it reduces to an exact science the art of breeding in the case most carefully studied by him, that of entire dominance. "No animal or plant is 'pure' simply because it is descended from a long line of ancestors possessing a desired combination of characters, but any animal is pure if it produces gametes (germ-cells) of only one sort, even though its grandparents may among themselves have possessed opposite characters."

The bearings of Mendel's discovery, confirmed by De Vries' experiments, on the origin of species are most important. The problem is whether aberrations, sports or discontinuous variations may not sometimes result in the formation of new species and types, or whether species are all the result of slow, continuous variations. As stated by Castle, "A sport having once arisen affecting some one character of a species, may by crossing with the parent form be the cause of no end of disintegration on the part of any or all of the characters of the species, and the disintegrated characters may, indeed must, form a great variety of new combinations of characters, some of which will prove stable and self-perpetuating.

Mendel's discoveries also explain the principle that new types of organisms are extremely

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variable, whereas old types are subject to little variation. A new type which has arisen as a sport will cross with the parent form. The offspring, says Castle, will then inherit some dominant character, others latent, and this will result in polymorphism of the race. Thus the suggestion of Galton that species may arise from sports is confirmed, while added cases are afforded by the recent remarkable experiments of De Vries, resulting in the origination of seven new species of primrose by sudden variations, or what he calls "mutations." Consult Bateson, W., 'Mendel's Principles of Heredity' (Cambridge 1913); Castle, W. E., 'Mendel's Law of Heredity' (Cambridge 1903); Morgan, T. H., 'The Mechanism of Mendelian Heredity' (New York 1915). See HEREDITY; SEX.

MENDELSSOHN, mĕn'dĕls-sōn, **Moses,** German Jewish philosopher: b. Dessau, Germany, 6 Sept. 1729; d. Berlin, 4 Jan. 1786. His father, Mendel, a schoolmaster, though very poor, gave him a careful education. He lived several years on the charity of persons of his own religion, devoting his time to study, chiefly in Hebrew and Hebrew literature, but also in mathematics and modern languages. In 1750 he was appointed by a silk manufacturer named Bernhard, a Jew, tutor of his children. At a later period Bernhard took him as a partner in his business. In 1754 he became acquainted with Lessing, with whom he contracted a close intimacy, which had a great influence on his mind. Intellectual philosophy now became his chief study. His 'Briefe über die Empfindungen' were the first-fruit of his labors in this branch. Mendelssohn contributed to several of the first periodicals, and now and then appeared before the public with philosophical works, which brought him fame, not only in Germany, but also in foreign countries. The most celebrated of these is 'Phædon,' a treatise on the immortality of the soul, first published in 1767. It has been translated into most European languages. He established no new system, but was, nevertheless, one of the most profound and patient thinkers of his age, and the excellence of his character was enhanced by his modesty, uprightness and amiable disposition. He knew how to elude with delicacy the zealous efforts of Lavater to induce him to declare himself a Christian. To this encounter between Lavater and Mendelssohn German literature owes one of its greatest dramas, Lessing's 'Nathan der Weise,' in which the author, in the person of the hero, commemorates the virtues, the tolerant spirit and comprehensive mind of his friend Mendelssohn. His 'Jerusalem, oder über religiöse Macht und Judenthum' (1783) was much misunderstood, partly because he attacked many deep-rooted prejudices of his race. 'Morning Hours' (Morgenstunden) was published in 1785. The last work of Mendelssohn was in defense of his friend Lessing, of whom Jacobi had asserted that he was a Spinozist, was entitled 'Moses Mendelssohn und die Freunde Lessings' (1786). Consult Kayserling, 'Moses Mendelssohn' (1882).

MENDELSSOHN-BARTHOLDY, Jakob Ludwig Felix, German composer: b. Hamburg, 5 Feb. 1809; d. Leipzig, 4 Nov. 1847. The kindly influences which, like a halo, encircled the life of the illustrious man, are reflected in many of his best compositions. He was born in prosperity, reared in plenty and at nearly all times was surrounded by conditions conducive to success. It has been said that in no way was Mendelssohn's naturalness and naiveté more evident than in his constant reference to his own foibles; and further, that the hearty way in which he enjoyed idleness and boasted of it were delightful in a man who got through so much work, who was singularly temperate and whose only weakness for the products of the kitchen was for rice, milk and cherry pie. "I do not in the least concern myself," said he, "as to what people wish or praise or pay for; but solely as to what I myself consider good."

It is doubtful whether the history of any other great musician discloses so wide a combination of qualities. Some of his biographers have expressed the thought that his happy disposition prevented his work from attaining that degree of depth which it might have done had his genius been subjected to fiery trials. Be this as it may, the fact remains that among all the German composers there is not one who has enjoyed such universal popularity, certainly in America and England, as Mendelssohn. His oratorios, 'Saint Paul' and 'Elijah,' are sung everywhere, while his 'Hymn of Praise,' the 'Overture to the Hebrides,' his symphonies, sonatas, concert-overtures, settings for certain Psalms and 'Songs without Words' are familiar to all.

Seventy-two of Mendelssohn's numbered works were published before his death and 47 later, while 23 of his compositions, many of them including two or more pieces, had no "opus" numbers assigned to them. Six other of his published compositions have been recorded, while his unpublished pieces, mostly in autograph and principally composed before he was of age, are quite numerous, including 12 symphonies, several fugues, concertos, sonatas, studies, fantasias, etc.

Felix was the second child and eldest son of Abraham Mendelssohn, a Jewish banker of Hamburg, and Lea (or Leah) Salomon, a resident of Berlin, and a Jewish lady of considerable property and attainments, to whom he was married on 26 Dec. 1804. The grandfather of Felix was Moses Mendelssohn (q.v.), who settled in Berlin in 1762 and married Fromet, daughter of Abraham Gugenheim, of Hamburg. Moses' father was named Mendel, a poor Jewish schoolmaster of Dessau, on the Elbe. Thus the name Mendelssohn (son of Mendel) simply perpetuates the Oriental method of name-making.

When not three years old Felix was taken to Berlin, and five years later (1816) his father took him and his sister Fanny, four years the senior of Felix, to Paris on a business trip. While there they both received lessons on the piano from Madame Bigot, but it was not till after their return to Berlin that their systematic education commenced. Ludwig Berger became their piano instructor and Zelter taught them thorough-bass and composition. In 1824 Moscheles became acquainted with the family, and while he declined to accept Felix as a pupil consented to offer him suggestions and advice. In the same year Spohr visited Berlin and renewed his friendship with the family, which had been formed at Cassel in the summer of 1822 where the family had gone for

the purpose of introducing Felix to him. In his eighth year Felix played the piano with remarkable ability, and about a year later (1818) he made his first formal public appearance. This was at a concert given by Joseph Gugel, a virtuoso on the horn. At 11 he joined the Singakademie as an alto. In 1820 Felix commenced systematic work as a composer, although before that time he had written from 50 to 60 complete movements. The earliest date of which a dated autograph is preserved was attached to a cantata entitled 'In rührend feierlichen Tönen,' which he completed on 13 January of that year.

The following year was eventful. He composed five symphonies, nine fugues, several pieces for the piano, two operettas and a number of songs. It was in this year, too, that he visited Goethe at Weimar. The poet was delighted with his talent. While at Weimar he played before the Grand Duke and Duchess and improvised before the court and also before Hummel. His compositions in 1822 were very numerous, and during this and the following year he wrote six symphonies, five concertos, a piano quartet, a violin sonata, a Magnificat and Gloria, and an opera in three acts, entitled 'Die beiden Neffen, oder der Onkel aus Boston.' On 31 March he played for the second time in public, at Aloys Schmitt's concert, taking part in a duo for two pianos, and again, on 5 December, he played at a concert given by Madame Milder-Hauptmann, when he gave one of his own concertos. It was probably in this year, too, that the practice of having informal musical performances on alternate Sunday mornings at the Mendelssohn home was begun. Felix directed, his sister Fanny presided at the piano, his younger brother, Paul, played on the cello, and his second sister, Rebecca, sang.

In 1824 his musical genius showed marked advance, as evidenced in his symphony in C minor, composed between 3 and 31 March. In the summer he was taken to Doberan on the Baltic, a seaside resort, and there received the impressions which later found expression in his 'Meeresstille Ouverture.' His wonderful power of extemporizing and his readiness to play the music of other composers are noteworthy features, and Hiller, who was with him in Frankfort in 1825, was carried away with his performances. In this year he met Cherubini in Paris, whither he accompanied his father on a visit. Toward the end of 1825 Mendelssohn's father purchased a large mansion, surrounded by spacious grounds, and under the influence of this charming home he became more and more devoted to his work. The beauties of Shakespeare were here unfolded to him. Felix was especially charmed with the 'Midsummer Night's Dream,' and probably then conceived the idea of the exquisite composition bearing that name which forms opus 61 and was first produced in Potsdam 14 Oct. 1843. The overture to a 'Midsummer Night's Dream' appeared earlier, and as a piano duet, its first public performance being given at Stettin in February 1827. Either during this or the previous year, Felix entered the University of Berlin, where he showed evidences of decided literary powers. On his return from Stettin he made preparations for his opera 'Die Hochzeit des Camacho,' but owing to the opposition of the director, Spontini, it was performed only once at that time, although, strange to relate, a complete performance of it was given at Boston, Mass., on 19 March 1855.

The principal compositions during 1828 were a cantata for the Tercentenary Festival of Albrecht Dürer, a cantata for a Congress of Science, an antiphona for four voices, and a concert overture. He also completed his overture to Goethe's 'Calm Sea and Prosperous Voyage.' During this year he organized a choir of 16 voices for practising Bach's Passion music. The year 1829 was an important one for Felix. Hitherto his father had not permitted him to regard himself as a professional musician, but this now being determined on, arrangements were made for him to visit some of the great capitals, with a view of gaining materials for his greatest works. His first journey was to England, where he arrived on 21 April 1829. He was received with much enthusiasm and also scored a success in society. His delightful manners and unfailing animation charmed every one. In November he was again in Berlin, and during the winter he completed the 'Reformation Symphony' for the Tercentenary Festival of the Augsburg Confession. He declined the professorship of music in the university, preferring to carry out the program which his father had mapped out for him. In May 1830 he visited Weimar, where he again met Goethe, afterward going to Munich, and later to Italy. Preparations for his return began in June 1831, and after visiting many cities he arrived in Munich where his concerto in G minor was performed for the first time on 17 October.

Another visit to London was made in the spring of 1832, during which he composed with unabated vigor. Among the more important productions of this time were his musical representation of Goethe's 'Walpurgis Night,' and the 'Fingal Overture,' which was finished in Rome. Again in Berlin in July 1832, he gave several concerts, producing the 'Walpurgis Night' at one of them. His time was fully occupied in composing, playing and conducting. His 'Italian' symphony was completed in March 1833, and sent to London where it was produced on 13 May under his personal direction. Later in the month, we find him conducting the Lower Rhine festival in Düsseldorf, where, as a result of his success, he was engaged as director of "all the public and private establishments of the town" for three years with a salary of 600 thalers. He resigned, however, during the second year to accept the position of conductor of the famous Gewandhaus Concerts at Leipzig, then considered the highest position in the musical world of Germany. Thither he proceeded in August 1835, to make arrangements for the season which began on the 4th of October following. Seven concerts were given between that date and 20 November, when he was shocked by the news of his father's death which had occurred the day before. For the first time his radiant disposition forsook him and he fell into a despondent mood. During this season of sadness, however, he was able to finish the oratorio of 'Saint Paul' while he also maintained the excellence of the concerts for which he was responsible. The great oratorio was first produced at the Lower Rhine Festival at Düsseldorf 22 May

1836. About this time he took charge of the Frankfort Cäcilien-Verein during the illness of the director, and there made the friendship of Madame Jean-Renaud and her family. He became devotedly attached to her youngest daughter, Cécile, to whom he was married on 28 March 1837. Returning to Leipzig he conducted another successful season, closing with a performance of 'Saint Paul,' for the first time produced in that city. In August 1837, he left his bride for the purpose of conducting 'Saint Paul' at the Birmingham Festival. This was his fifth journey to England, and before he returned he held conferences with his friend, Klingermann, over the plan of a new oratorio having the prophet Elijah as the central figure. He reached Leipzig on 1 October in time to conduct the first concert of the Gewandhaus on the same evening.

The year 1839 was notable for the composition of the 'Ruy Blas' overture for the Leipzig Theatre and the setting of the 114th Psalm to music. In the following year the invention of printing was celebrated in Leipzig by a festival, and the 'Festgesang,' for men's voices, and 'Lobgesang,' or 'Hymn of Praise,' were composed for the occasion. During this year Mendelssohn accepted the direction of the musical department of the Berlin National Academy of Arts, but before entering his duties he made another visit to Birmingham to conduct a performance of the 'Hymn of Praise. On his return he was installed as General-Musik-Director in Berlin, but having the privilege of living where he pleased, he returned to Leipzig. About this time he composed the music for the 'Antigone' and 'Œdipus Coloneus' of Sophocles, Racine's 'Athalie' and Shakespeare's 'Tempest' and 'Midsummer Night's Dream.'

Another sad trial now befell him in the death of his mother, 12 Dec. 1842, and in November of the following year he removed to Berlin. The king of Saxony had recently established a conservatory of music, a plan which Mendelssohn had long cherished, and he and Schumann were appointed professors of composition and the piano. Meanwhile the Gewandhaus concerts were left in charge of Hiller. In 1844 he visited London for the eighth time in response to an invitation to direct several concerts of the London Philharmonic Society. In October he resigned his position as General-Musik-Director in Berlin and took a much-needed rest until the autumn of 1845 when he again assumed charge of the Gewandhaus orchestra.

Early in 1846 he was back in Leipzig where he took charge of two classes in piano and composition, and among his pupils were Goldschmidt, De Sentis, Tausch and others. The season of 1845-46 was unusually brilliant in concert work and the program showed a great breadth of selection. At the eighth concert he brought with him Jenny Lind, who was then heard for the first time in Leipzig. On 5 Aug. 1846, a preliminary rehearsal of 'Elijah' was held in Leipzig and soon after he started for England on his ninth visit, the complete score having been sent over a month earlier for translation. First there was a rehearsal with piano accompaniment at Moscheles' house, followed by two full rehearsals at the Hanover Square Rooms, and later by rehearsals in Birmingham, where on 26 August the oratorio was performed for the first time in public. One of his biographers states that "there was a mad rush at the close of the performance to grasp the hand of the hero of the day, who thanked all present for their share in the performance with which he was so deeply gratified." Returning to Leipzig he remodeled the oratorio, however, making so many changes that scarcely a movement stands to-day as it was originally written. The complete edition was published in July 1847. The Sacred Harmonic Society of London now invited Mendelssohn to give a production of 'Elijah' in its revised form in Exeter Hall, and for the tenth and last time he visited London in April 1847. Four performances were given, Queen Victoria and the Prince Consort being present at the second of the series. After giving other productions of the 'Elijah' in Manchester and Birmingham, followed by a performance with the Philharmonic Society, he returned to Frankfort, weary and utterly worn out. To add to his now unhappy condition, his sister Fanny, whom he had loved devotedly, was stricken with paralysis and died 14 May 1847. On hearing the sad news he fell fainting and for several weeks was utterly prostrated. Seeking diversion, he revisited Switzerland during the summer, where, it is said, he applied himself to water-color painting and made excellent progress in that direction. Later he resumed composition, numbering among his productions at that time the beautiful quartet in F minor (Opus 80), and he also wrote some parts of a newly commenced oratorio, 'Christus,' which he left unfinished. He returned to Leipzig in September, but attempted nothing serious in a musical way. His spirit was broken and he dreaded to appear in public. The beginning of the end came on 9 October while calling on Madame Frege, whom he was accompanying in his last set of songs. She left the room to order lights, says one of his biographers, and on her return found him shivering and suffering violent pains in the head. He rallied somewhat, but another relapse occurred on 3 November and he never spoke again. He died the following day and on Sunday, the 7th, was borne to the Paulinen-Kirche, preceded by a band playing one of his 'Lieder ohne Worte' (Book V, No. 3), which Moscheles had scored for the occasion. Thence the coffin was taken to the Alte Dreifaltigkeits-Kirchhof in Berlin, where it was deposited in its last resting place.

A cross on the grave bears this inscription: "Jakob Ludwig Felix Mendelssohn-Bartholdy: geboren zu Hamburg, am 3 Feb. 1809; gestorben zu Leipzig am 4 Nov. 1847."

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R. I. GEARE,
United States National Museum.

MENDENHALL, men'dĕn-hâl, Thomas Corwin, American physicist: b. near Hanovertown, Ohio, 4 Oct. 1841. He was educated in the public schools and by his own efforts obtained a knowledge of physics and higher mathematics. In 1873 he became professor of physics and mechanics in the Ohio University, where he remained until 1878, when he accepted a call to the chair of physics at the Imperial University in Tokio, Japan. There he founded a laboratory, an observatory, a scientific society, inaugurated a system of lectures, which work was highly approved by the Japanese government. In 1881 he returned to the Ohio University, and in 1884 accepted a position in the Signal Service at Washington. In 1886 he was elected president of the Rose Polytechnic Institute, but resigned in 1889 to become superintendent of the United States Coast and Geodetic Survey, and from 1894–1901 was president of the Worcester Polytechnic Institute. He has published several scientific papers and a book entitled 'A Century of Electricity' (1887).

MENDENHALL, Walter Curran, American geologist: b. Marlboro, Stark County, Ohio, 20 Feb. 1871. In 1895 he was graduated at Ohio Normal University; studied at Harvard in 1896–97 and at Heidelberg, Germany, in 1899–1900. In 1894–96 he was geologic aid, in 1896–1901 assistant geologist and since 1901 geologist on the United States Geological Survey. He had charge of the ground-water investigations of the survey in 1907–10 and since the latter year has served as chief of the Land Classification Board. He is the author of various memoirs and articles on professional topics.

MENDES, Catulle, kă-tül mŏñ-dās, French writer: b. Bordeaux, 22 May 1841; d. Paris 8 Feb. 1909. His verse is marked by extreme devotion to form. He also wrote a great deal of prose — short stories, longer works of fiction, dramas. There is much affectation about them all. Among his books are 'Poésies' (1878); 'Monstres Parisiens' (1882); 'La Rose et le Noir' (1885); 'Grande Maguet' (1888). Of his plays may be cited 'Le Capitaine Fracasse' (1872) and 'Fiamette' (1889).

MENDES LEAL DA SILVA, José, bō sā' māñ'dāsh lā-āl' dā sēl'vă, Portuguese statesman and poet: b. Lisbon, 18 Oct. 1818; d. Cintra, 14 Aug. 1886. He was Minister of the Navy and of Foreign Affairs; Ambassador to France, 1874–83; and to Spain, 1883–86. His vogue as a poet has been very great in his own country and his 'Songs' ('Canticos') were first collected in 1858. He wrote also a large number of plays, some of them very popular on the Portuguese stage, as 'Uncle Andrew from Brazil'; and 'The Sportsman': and also several romances. He became a member of the Portuguese Academy in 1845.

MENDEZ-PINTO, mān'dāsh pēn'too, **Fernao,** or **Fernam,** Portuguese traveler: b. Montemor-o-Velho, near Coimbra, Portugal, about 1510; d. Almada, near Lisbon, Portugal, 8 July 1583. He departed for the Indies in 1537, returning in 1558, and after his death a very curious relation of his voyages, 'Peregrinacao de Fernam Mendez-Pinto' was published, which has been translated into French, English and other European tongues. Congreve, in his 'Love for Love,' called him "a liar of the first magnitude," and from that time his narrative was considered as a romance: but his good faith and veracity are now generally admitted.

MENDIBURU, mān-dē-boo'roo, **Manuel de,** Peruvian soldier and historian: b. Lima, 1805; d. there, 21 Jan. 1885. While a student he joined the patriot forces in 1821, was captured by the Spanish and held prisoner till the close of the war. Among various civil and military posts afterward held by him were those of Minister of War and Finance. He published a 'Diccionario historico-geografico del Peru,' a work of great value and highly prized by scholars. The first part, in eight volumes, deals with the Inca and colonial periods, and its publication, begun in 1874, was concluded after General Mendiburu's death. The second part was not published.

MENDICANCY, a condition of permanent pauperism, where professional beggars are so numerous that government laws are necessary to remove or control them. A population of mendicants naturally results in a criminal community and all countries containing this element have endeavored to remove this evil by legislation. There were beggars in biblical times. As early as 1351 France was compelled to pass laws against "Lazy persons, truants, and able-bodied beggars." Laws were passed in England on this subject as early as the time of Henry VIII. Mendicity has been found to exist to a greater extent in South European countries than elsewhere, and in Spain and Italy the professional beggar has been one of the greatest evils, the standard of prosperity, morality and intelligence declining as mendicity increased.

According to the census statistics of 1900 there were 91,227 professional beggars in Spain, of whom 51,948 were women. In some of the cities beggars are licensed to carry on their trade. Seeking alms is recognized as a legiti-

mate business, and the municipality demands a percentage upon the collections. Seville is the only city in the kingdom which forbids begging upon the streets. In some of the other towns beggars are allowed to come out and ply their trade one day in the week, perhaps Friday or Sunday, when the streets swarm with them as they go from house to house, sometimes on horseback, and it is said sometimes in carriages also. In Madrid there is no restriction and no license, and the streets are lined with them.

The United States gathers no figures of beggars as their existence is illegal. If paupers, they are supposed to go to the almshouses. The 1910 census showed 73,645 so cared for, 9,500 in New England, 10,272 in New York, 8,653 in Pennsylvania, 7,400 in Ohio, 5,395 in Illinois, 2,927 in Indiana, 2,641 in Wisconsin, 2,600 in California, etc.

In Mexico, both Indians and native Mexicans to the number of thousands make up the army of professional beggars, and Mexico appears to have no laws to regulate them. In the Mexican cities and at fairs and festivals the mendicants are to be seen in astonishing variety; some maimed, some blind and able-bodied fellows with most artistic "make-ups" of tattered garments and unkempt hair and beards. Some of these stand before one silently with a dumb appealing look in their eyes. Others kneel in the midst of the way and fill the air with their doleful stereotyped appeals for charity. These beggars are humbugs after the manner of their kind the world over.

In the United States, where labor is in greater demand and better paid than abroad, there seems to be no excuse for mendicity, and yet there are many professional beggars here, largely able-bodied foreigners. The laws of Massachusetts, New York and some other States make vagrancy a crime and authorize the commitment of tramps to the workhouse, house of correction and common jail for varying periods. In the Atlantic Coast States the evil is a serious one.

New York City is a beggars' paradise. Between 6,000 and 8,000 professional mendicants make that city their home. Every other city in the United States suffers from the professional beggar, but not to the same extent as New York. The outdoor officer of the Charity Organization Society says that mendicants from all parts of the country flock to New York because the indiscriminate giving there is so common. Cities and States ship their beggar population to New York. About 10 per cent of these beggars are women.

MENDICANT ORDERS. See MONACHISM.

MENDIVE, mān-dē'vā, **Rafael Maria de,** Cuban poet: b. Havana, Cuba, 24 Oct. 1821; d. Matanzas, Cuba, 1886. His first collection of poems (1847), entitled 'Passion-Flowers,' is widely popular. Banished in 1869, he lived alternately in New York and Nassau, writing legends and stories in verse. He was one of the most notable of Spanish-American poets; and many of his verses received English, French and Italian translations.

MENDOCINO. See CAPE MENDOCINO.

MENDOTA, Ill., city of La Salle County, 80 miles west of Chicago, on the Chicago, Milwaukee and Saint Paul, the Illinois Central and the Chicago, Burlington and Quincy railroads. The city contains the Blackstone School, Lincoln School, a public library, agricultural implement works, machine works, water-tank heater works, etc. The municipality owns the water-supply system and the sewage system. Pop. 3,806.

MENDOTA LAKE. See FOUR LAKES.

MENDOZA, měn-dō'thā, **Antonio de,** Spanish administrator: b. about 1485; d. Lima, Peru, 21 July 1552. In 1535 he was appointed by the Emperor Charles V, with whom he was in great personal favor, viceroy of New Spain (Mexico), being the first of 64 viceroys, with the longest administration and that which shows the best record in the history of that provincial government. He made many reforms, especially in relieving the oppressed natives; developed agriculture and mining; established the first Mexican mint; founded the first college; and introduced the first printing press. In 1551 he became viceroy of Peru, where he caused to be prepared a code of laws that has been the basis of the colonial and, to a large extent, of the present legal system of the republic. It was under Mendoza's administration in Mexico that Francisco Vasquez de Coronado (q.v.) undertook his famous exploring expedition.

MENDOZA, Diego Hurtado, dē-ā'go hoortā'do, Spanish author and statesman, great-grandson of the Marques de Santillana (q.v.): b. Granada, 1503; d. Madrid, 15 April 1575. He was educated, as a younger son, for the Church, but, after studying Arabic at Granada and the humanities at Salamanca, entered the army and in 1525 fought at Pavia. He acted as Charles V's Ambassador to England in 1537, to Venice in 1538, to the Council of Trent in 1545 and to the Papal See in 1547, when he became governor of Siena. With Philip II he quarreled and in 1564 was interned in Granada, only returning to court in 1574, soon before his death. To his stay in Italy was due his influence in making the Spanish lyric thoroughly Italianate; and from Italy he brought an unusual knowledge of the classics as well as a fine collection of Greek manuscripts. Mendoza also perfected the Spanish poetic epistle. The famous romance, 'Lazarillo de Tormes,' has been ascribed to him. But his greatest work is his history of the Moorish insurrection, 'Guerra de Granada,' a model of historical impartiality and on a theme for which knowledge of Arabic peculiarly fitted him. So impartial was this work that it was not published complete for many years, and even now a good edition is a desideratum. Consult the biography in German by Fesenmair (1882).

MENDOZA, Pedro de, Spanish explorer in America, founder of Buenos Aires: b. Guadix, Granada, about 1487; d. at sea, 1537. He was a favorite of Charles V; fought bravely in Italy; and in April 1535 left Spain with 12 ships and 800 men, sailed up the Plata River and founded the city then called "Nuestra Señora de Buenos Ayres." His further movements were unfortunate; Indians and disease attacked his men, three-fourths of whom, including his own brother, were lost. The natives captured and burned the city, and Mendoza, rescued none too soon by his brother, who came with reinforcements, set sail for

home. But his health and reason were undermined and he died on board ship.

MENDOZA, Argentina, a province in the western part, on the eastern slope of the Andes Mountains; area, 56,502 square miles. Mount Aconcagua, 22,427 feet, is on the northwestern boundary. The western part of the province is mountainous, the eastern part pampa land and fertile where watered by the streams or by irrigation, but the climate is hot and dry. There are four important rivers, the Mendoza, Atuel, Diamante and Tunuyan. The Transandean Railway from Valparaiso to Buenos Aires divides the territory. There is also a railway to San Juan and San Carlos, and a southern line from San Rafael east. It is rich in minerals, especially silver and copper. Coal and petroleum abound. Grapes grow luxuriantly and a large quantity of wine is shipped to the other provinces. Cattle, hides and wool are the chief exports. Wheat and corn are increasing in importance. Pop. 277,535.

MENDOZA, Argentina, city, capital of the province of Mendoza, at the base of the Andes, on the eastern side of the mountains, on the railroad which extends from Buenos Aires to Valparaiso, Chile, about 600 miles west by north from Buenos Aires and 165 miles east of Valparaiso. It is about 2,400 feet above the sea. The city was founded in 1559. It belonged to Chile previous to 1776. In 1861 it suffered from an earthquake which killed about 10,000 people and destroyed a great part of the city. The Transandean Railway connects the city via Villa Mercedes with all the large cities of the eastern coast, also with Santa Fe and Corrientes. It has eight banks, seven department stores and is an important trade centre. It is the seat of two national normal schools, a national college and an agricultural institute. Pop. about 58,790.

MENE, mē'nē (numbered); **TEKEL** (weighed); **UPHARSIN** (divided), the Chaldee words traced on the wall at Belshazzar's feast and significant of his impending doom (Dan. v). The astrologers could not read them, because they were written in antique Hebrew characters, but Daniel understood their awful meaning; and the same night witnessed their fulfilment.

MENEDEMUS, founder of the school of philosophy called Eretrian from his native city Eretria: b. about 351; d. about 277 B.C. Traditions vary as to whether he turned to philosophy under the influence of Plato, or under that of Stilpo of Megara, but his tenets seem to have most resembled those of the Megarian school.

MENELAUS, měn-ē-lā'ŭs, *in Greek legendary history,* the son or grandson of Atreus and brother of Agamemnon (q.v.). From his father-in-law, Tyndareus, whose daughter Helen he married, he received the kingdom of Sparta or Lacedæman. Paris, son of Priam, king of Troy, having carried off his wife, Helen, with a part of his treasures and some female slaves, and conveyed them to Troy (q.v.), Menelaus, accompanied by Ulysses (q.v.), went thither to demand the restitution of his wife and property, and this being refused, he summoned the Greek princes to revenge the affront according to their promise. After the conquest of Troy, Menelaus took Helen to return with her to his native land. Eight years he wandered before he reached home. On the island of Pharos (q.v.) he surprised Proteus asleep and compelled him to disclose the means which he must take to reach home. See TROJAN WAR.

MENELEK, emperor (negus) of Abyssinia: b. 1842; d. December 1913. He was the son of a king of Shoa and secured the throne with some fighting in 1889, in which year he signed the Treaty of Uccialli with Italy. He discovered some years later that by the Italian text of the treaty he was bound to conduct his foreign affairs through the Italian government, while the Amharic text made this optional. He accordingly wrote to Queen Victoria in 1893 and protested against the treaty as infringing upon his sovereign rights. In 1896 he fought a war with the Italians and severely defeated them in the battle of Adowa. His complete independence was then recognized by Italy and the other European powers. He concluded treaties of commerce with Great Britain and other countries and co-operated with the British army against the Sudan dervishes. A humane and just ruler, he endeavored to apply the arts of civilization to his backward country. He was succeeded by Lij Yassu, who was dethroned in 1917.

MENENDEZ DE AVILES Y MARQUEZ mā-nēn'dĕth dā ä-vē-lās' ē mär'kĕth, Pedro, Spanish captain, founder of the city of St. Augustine, Fla.: b. Aviles, Austria, 1519; d. Santander, 17 Sept. 1574. In June 1565 he sailed with 1,500 men in 19 vessels to dislodge the French in Florida; landed there 28 August and 6 September began a fort, the nucleus of the present town. He attacked the French garrison at Fort Caroline, during the absence of part of the force, which had set out to attack him but was storm-stayed and thus wrecked. Menendez slaughtered the remnant at the fort and those saved from shipwreck. He returned to Spain in 1567; visited America twice again, strengthening Saint Augustine in 1568, and in 1570 sending a party of colonists to the Chesapeake and up the Rappahannock where they were massacred by the natives. He was recalled to Spain shortly before his death. During the last two years of his life he was governor of Cuba. Consult Winsor, J., 'Narrative and Critical History of America' (New York 1886).

MENENDEZ Y PELAYO, ē pā-lī'ō Marcelino, Spanish critic: b. Santander, 1856; d. there, 19 May 1912. He was educated at Madrid and Paris; in 1878 became professor of philosophy and letters in Madrid; three years later was elected to the Spanish Academy; and in the late nineties became director of the Biblioteca Nacional. He lectured often, especially at the Athenæum in Madrid. For several years he was dean of the faculty of letters at the University of Madrid, he served a term as senator, was counsellor of public instruction and chief of the board of archives. He received many honors, including the grand cross of the Order of Alfonso XII. His literary style was finished and elegant and he was ever a staunch defender of Catholicism. He wrote 'Estudios criticos sobre Escritores Montañeses' (1876); 'Horacio en España'

(1877); 'Historia de los Heterodoxos Españoles' (1880–81); 'Calderon y su Teatro' (1881); 'Odas, Epistolas y Tragedias' (1883); 'Historia de las Ideas estéticas en España' (1884–91).

MENENDEZ PIDAL, Ranion, Spanish critic, philologist, educationalist and general literary man: b. Coruña, 13 March 1869. Educated at the universities of Madrid and Taulause he became professor of Romanic philology at the former (1899). See PIDAL RANION MENENDEZ.

MENEPTAH, or **MERNEPTAH,** king of Egypt about 1250 B.C. He succeeded his father, Rameses II, and reigned for a period of 20 years. His reign was troubled by an invasion from Libya, but he succeeded in crushing it and thereafter set about the construction of numerous buildings and monuments, especially at Tanis. In 1898 his mummy was discovered at Thebes and now reposes in the Cairo Museum. Previous to 1896 it was thought that Meneptah was identical with the Pharaoh of the Exodus, but in that year an inscription was uncovered in which it was stated that Israel was settled in Palestine in the fifth year of Meneptah. This inscription is of prime historic interest as fixing the period of the settlement of Israel in Palestine and as the only mention of Israel on Egyptian monuments. For the inscription consult 'Der Sieges-hymnus des Meneptah auf der Flinders Petrie Stele' (in *Zeitschrift für ägyptische Sprache,* Vol. XXXIV, Leipzig 1896). Consult also Breasted, J. H., 'History of Egypt' (2d ed., New York 1909) and Budge, E. A. T. W., 'History of Egypt' (New York 1902).

MENES, mē'nēz, according to Egyptian traditions, the first king of Egypt. Herodotus relates that he was the founder of Memphis, which he built on a piece of ground which he had recovered from the Nile by altering the river's course. According to Diodorus, Menes introduced into Egypt the worship of the gods, as well as a more elegant style of living. He has been identified by some with the Mizraim mentioned in Gen. x, 6. A tomb supposed to be that of Menes was discovered near Nakâdeh by De Morgan in 1897. Consult Sethe, K., 'Menes und Grundung von Memphis'; Breasted, J. H., 'History of the Ancient Egyptians' (New York 1908). See EGYPT.

MENG-TSE, měng-tsĕ'. See MENCIUS.

MENGER, Karl, Austrian political economist: b. Neu-Sandez, Galicia, 1840. He was educated at the universities of Vienna and Prague, where he gave special attention to law and political economy. In 1872 he began his long connection with the University of Vienna, being appointed full professor of political economy in 1879. He was created life member of the Austrian House of Peers in 1900. As an economist he is undisputed leader of the new school of economics in his country and is opposed to the traditional system hitherto followed. He has published several important works, including 'Grundsätze der Volkswirtschaftslehre' (1871); 'Untersuchungen über die Methode der Sozialwissenschaften und der politischen Oekonomie insbesondere' (1883); 'Die Irrtümer des Historismus in der deutschen Nationalökonomie' (1884); 'Beiträge zur Währungsfrage in Oesterreich-Ungarn' (1892) and the article "Geld" (in 'Handwörterbuch der Staatswissenschaften,' 3d ed., 1909).

MENGS, Anton Raphael, German painter: b. Aussig, Bohemia, 12 March 1728; d. Rome, 29 June 1779. In early childhood his father, Ismail Mengs, a miniature painter of little talent, who was settled at Dresden, took him in hand to make a painter of him, and in 1741 carried him to Rome and set him to study the antique and to copy Michaelangelo and Raphael. He was compelled to do a certain task in painting every day; his day's work subjected to severe criticism; and he was even punished if it was not satisfactory. From this constant practice he early gained skill as an artist, and when he returned to Dresden his talent and proficiency were at once recognized by August III, who appointed him court painter and gave him permission to return to Rome. At Rome he attended the Academy and in 1748 produced a large and elaborate composition, 'The Holy Family,' taking as model for the Mother of Jesus a beautiful peasant girl, whom he afterward married. On his return to Dresden he was commissioned to paint an altar-piece, 'The Ascension of Christ,' for the high altar of the Chapel Royal, and was given permission to return to Rome for the purpose of doing so. A new academy of painting having been opened in the capitol he was appointed director and painted for the Celestines the ceiling of their church, San Eusebio, for Cardinal Albani the 'Parnassus' in the ceiling of his villa, and several oil paintings, including 'Cleopatra,' 'The Holy Family' and 'The Magdalen' for private persons. When King Charles III of Spain summoned him to Madrid he executed for him in fresco there 'The Assembly of the Gods' and 'The Descent from the Cross'; he also completed the altar-piece for Dresden. He returned to Italy in 1769, stayed eight months at Florence and painted for the Pope a ceiling fresco for the Vatican Library. In 1772 he went to Spain and produced for the king the fresco 'Apotheosis of Trajan,' his finest work, but returned to Rome in 1775. On his death the Cavalier d'Azara set up a statue to him and Catherine II of Russia raised a splendid tomb for him in Saint Peter's. He was certainly one of the most important painters of his day, and if he possessed none of the free and living originality of genius he was a master of noble composition and design. He was catholic in taste and eclectic in style, drawing inspiration from the antique, as well as imitating Raphael, Titian and Correggio, whose styles he tried to blend. Consult Woermann, 'Ismail und Raphael Mengs' (in the *Zeitschrift für bildende Kunst,* No. 5, 1893).

MENHADEN, a species of fish (*Brevoortia tyrannus*) of the herring family (*Clupeidæ*), appearing in vast schools along the Atlantic Coast of America. Owing to the large number of local names applied to this species much confusion concerning its identity and distribution exists in the minds of fishermen and others. The name "menhaden" (Indian) is used chiefly in southern New England. North of Cape Cod the fish is called pogy, or occasionally hardhead; in New York and New Jersey, bunker or marshbunker; the fishermen of Delaware

and Chesapeake bays know it as bay alewife, and in the latter region and southward also as bug-fish or bug-head; still farther south it becomes the fat-back, and so on. From the other herrings the menhaden is readily distinguished by its very large head, large mouth, complex gill strainers and crenulated scales. The body is deep, the fins small, the mouth toothless and the color bluish and silvery, with one large and several small black spots.

Like some other pelagic and migratory fishes the menhaden is exceedingly irregular in its movements and variable in abundance and distribution from year to year, but its general range is from Nova Scotia to Brazil and oceanward, so far as observed, to the Gulf Stream. In spring it approaches the coasts and extends northward with the alewives and other species, probably for the purpose of spawning in brackish water, though little is actually known of its spawning habits. In winter Cape Hatteras marks the northern limit of its abundance. The menhaden swims in compact schools of large size, the movements of which at the surface, or sunken to a greater depth, are extremely irregular.

These irregularities are owing, no doubt, to corresponding variation in its food-supply, which consists wholly of the minute organisms, both vegetable and animal (plankton), that are caught as the fish swims with open mouth, straining the water through its lips and gill-arches as it goes. Owing to its strong oily taste and extreme bonyness its value as human food is very slight, but as furnishing food for other fishes, as bait, and for the manufacture of oil, fertilizer and other products, it has a very great economic importance. Large companies control its capture for the latter purposes and, besides pound nets, utilize many steamers provided with purse seines and derricks, by means of which entire schools are taken at a haul and lifted on deck. The oil is extracted and the solid parts ground up for fertilizer at factories on shores. The product varies from year to year, but the total weight of fish taken runs into the hundreds of million pounds. The catch of fish and industries involved reached their highest level of importance in the latter part of the last century, since which both have much diminished, whether by reason of over-fishing or because the menhaden no longer come to the northern part of the coast in so great abundance, is not determined. Consult Goode, 'History of the Menhaden,' Report United States Fish Commission, 1879, and recent reports of the United States Bureau of Fisheries.

MENHIRS, elongated, rough-hewn monoliths standing with one end in the ground. They are found of various sizes, from about 6 to as much as 67 feet high, the latter being the height of that at Locmariaquer in Brittany. Singular superstitions naturally attach to some of them. See STONES, STANDING.

MENIERE'S DISEASE, a disease of the ear first described by the French physician, Emile Antoine Ménière, in 1861. It is one form of auditory vertigo and usually attacks persons of middle age. The principal causes are sunstroke, influenza, rheumatism, anæmia and venereal diseases. The attack is usually very sudden and appears to be due to hæmorrhage into the labyrinth. The seizures may occur at irregular intervals of days or even weeks. While the symptoms of dizziness, vertigo, nausea, etc., gradually disappear the deafness is generally permanent. Potassium iodide is most serviceable in reducing the dizziness. See EAR.

MENIN, Belgium, town in the province of West Flanders, on the Lys and on the Belgo-French frontier here demarcated by the river, seven miles southwest of Courtrai, and 30 miles southwest of Ghent. It contains lace and cotton mills, tobacco factories, etc. In the neighborhood there were extensive tobacco plantations previous to the war of 1914–18, in which Menin suffered severely. It fell to the Germans during the great rush of both armies northward to the sea; was taken by the British in a spirited attack, but was subsequently evacuated by them for strategic reasons. The British having noted a German concentration of troops and *materiel* in Menin made an aerial attack upon it which brought damage to a great number of buildings. Pop. 18,600.

MENINGITIS. The brain is enveloped by three membranes called the meninges. Next to the skull comes the dura mater, then the arachnoid and innermost is the pia mater. These three membranes are prolonged from the brain in three envelopes of the spinal cord. Meningitis is an inflammation of the meninges of the brain or of the spinal cord. It is very rarely a primary condition, but is usually secondary to infection from micro-organisms of many types, or results from chronic poisonings such as lead, alcohol, etc. Hence modern medicine speaks of various meningitides rather than one meningitis. When the surface of the brain is wounded by some object breaking through the skull, or a piece of broken bone of the skull, thrust inward by some blow, an artery is ruptured and the blood flows between the membranes. Such a condition is called traumatic meningeal hæmorrhage. When the dura mater becomes inflamed after a wound, or after inflammation of other parts of the head, as the ears, teeth, etc., there results a condition called pachymeningitis externa. Inflammation of the meninges, however, is generally confined to the pia mater and the arachnoid and is then called leptomeningitis. Pachymeningitis, inflammation alone or chiefly of the dura mater, may extend to the other membranes. Inflammation of the cerebral meninges is cerebral meningitis; of the spinal meninges, spinal meningitis; of those of the brain and spinal cord together, cerebro-spinal meningitis. Ascending meningitis is a meningitis ascending from the lower part of the spinal cord.

Pachymeningitis has one form involving the external surface of the dura mater and resulting from blows or other injuries, and from osseous growths. There may be no well-defined symptoms, but usually is local headache and tenderness on pressure. The onset is usually sudden. Many cases of meningitis of the type called "serous" are not other than pachymeningitis. If the dura mater, which is normally free, is bound to the skull by fibrous exudation, and especially if pus forms and hæmorrhages occur, there are symptoms of pressure. Inflammation of the internal portion

of the dura mater may result from the extension of inflammation from adjacent parts, such as the ear, the frontal or the ethmoidal sinus; or it may attend cases of pernicious anæmia, chronic syphilis, tuberculosis and chronic wasting diseases. It occurs chiefly in old age, but has been seen in children. There are fibrinous deposits and extravasation of blood in cysts (hæmatoma), and occasionally pus forms. The brain is anæmic, sometimes softened. The symptoms are those of irritation — convulsions, vomiting, dilated pupils which are not affected by exposure to light, a slow irregular pulse, etc.— and those of compression or pressure — coma, etc. Pachymeningitis is usually fatal.

Cerebral meningitis (simple or cerebral meningitis), in the acute form, is not common, and is most apt to occur in men engaged in hard mental pursuits. It may be caused by injuries, by sunstroke, by spirituous liquors, etc., and is very dangerous, death usually occurring in from three to eight days. The brain is reddened and covered more or less with pus and coagulated fibrin or lymph, and its superficial layer is softened. There is almost always watery effusion into the brain-cavities. The symptoms are those of three stages: (1) Headache; (2) delirium; (3) coma. At first there may be slight fever, some photophobia, frequency and irregularity of the pulse and some contraction of the pupils. There is a disposition to vomit, a slowness in movements of the bowels and often hyperæsthesia. Then comes delirium, which may or may not be active; the patient talks much and tries to get out of bed; does not obey readily. There is more or less trembling of the limbs, with difficulty in moving them. One pupil is likely to be dilated. Sometimes strabismus occurs; the pulse is very irregular; and paralysis begins. Then follows coma, loss of sense, sensation and of voluntary motion; there is sighing, the pulse is frequent and weak, the pupils do not respond readily to light and the capillaries of the skin and eye are congested. Recovery from this disease cannot occur after the period of coma begins.

Sub-acute or chronic cerebral meningitis is a secondary disease, sometimes associated with chronic syphilis, Bright's disease, alcoholism, etc., though the cause is not always ascertained. The lesions are similar to those of acute meningitis, but less pronounced. There is less of serum and pus, and the exudated fibrin is more circumscribed. The symptoms are insidious and vague. Headache, vomiting and photophobia are rare. The slight delirium is followed, it may be, by somnolency, irregular pulse, strabismus and sighing respiration. With coma the pulse is rapid, 120 or more, and the patient dies as in acute meningitis.

Tubercular meningistis, also known as acute hydrocephalous granular meningitis and basilar meningitis, is an acute tuberculous inflammation of the pia mater, caused by a deposit of miliary granules over the surface of the brain, but most numerous at the base, in the track of the cerebral vessels, and in their sheaths. There is a noticeable vascularity, especially in the ventricles. The pia mater is thickened and opaque and covered with a semi-purulent exudation. Serum fille the ventricles and formina, pressing upon the convolutions, and assists in softening portions of the brain. The lesions in this disease are rarely limited to the brain; tubercles are found in other organs, especially the lungs. The disease is a phase of that protean malady, tuberculosis, though the cerebral lesions may first be noticed. The primary causes are a hereditary diathesis (scrofulous or tuberculous), foci of caseous degeneration in some organ, a suppurating joint, or a scrofulous inflammation of bone. The physically weak children of tuberculous parents are most subject to this disease, and in cases where strong children are attacked there is generally found a tubercular relative. Though the disease is essentially a disease of early life (from nine months to 10 years), it also attacks adults. Most of those affected die in from two to six weeks. The symptoms may be classed under three heads: (1) Obscure symptoms; (2) those of rapid development; (3) those of coma. There are seen listlessness, loss of appetite, occasional vomiting, slowness of the bowels and somewhat frequent pulse. Sometimes there is headache, a remittent form of fever and then rapid development of diagnostic symptoms. The patient talks a good deal. One of the most important symptoms is a change in the disposition through which the child, although bright and lively before, suddenly becomes listless, or excessively emotional, a condition which may continue for several weeks. There are irregularity of the pupils and pulse, a sharp "cephalic" cry, severe headache, insensibility to light and sound, grinding of teeth, a flushed face in paroxysms, usually before convulsions, rolling and drawing back of head, urine scanty and high-colored, oscillation of the eyes, obstinate constipation, etc. With coma comes strabismus; the pupils do not contract under the influence of light, but will contract and expand when the bowels rumble or the patient is moved. There are convulsions, paralysis and automatic movements of the feet and hands, it may be for hours. The thumb may be turned in. There is a hollowed abdomen (boat-shaped) and congestion of the eyes, a puri form secretion sticking the eyelids together; involuntary discharge of bowels and bladder, are common. For treatment of this affection place patient in bed, in a quiet room; give easily digested food; apply an ice-cap to the head and warmth to the feet. Further treatment should be in the hands of a physician. Much can be done by parents and guardians to prevent the onset, by not developing the nervous system at the expense of the muscular and digestive systems. Precocious children are to be judiciously restrained, and outdoor life encouraged. Tuberculous meningitis in adults is commoner in men than in women, and most frequently occurs between 17 and 30. It is generally fatal in 2 to 14 days, about one in 200 cases recovering.

Spinal meningitis is not common; it is usually caused by injuries, is liable to occur in children with spina bifida and is rarely amenable to treatment. Death occurs usually in from 8 to 10 days, either from extension of inflammation to the brain and pressure there by fluid, or from asphxyia due to spasms of the respiratory muscles. The lesions are similar to those of cerebral meningitis. The chief symptoms are pain in the spine and extremities, increased by movements

of the body, great sensibility of the surface of the body, spasms of muscles, opisthotonos and dyspnœa.

Epidemic cerebro-spinal meningitis, or spotted fever, is due to a special micro-organism, the diplococcus intra-cellularis. Death frequently occurs in a few hours; recovery usually requires 30 or more days. The disease has spread over sections of this country two or three times, mainly in the winter and spring. The exact manner of its transmission is not known. One form is characterized by fever with no eruption; the other by fever and an eruption. The symptoms are a chill or chilliness, followed by nausea and vomiting, fever, violent headache, sometimes with pain down the spinal column, general hyperæsthesia, great prostration, vertigo, tetanic rigidity of muscles, irritability or apathy, delirium and other symptoms of meningeal irritation, followed more or less rapidly by those of coma. In the majority of patients if the head is raised when the patient is lying on his back, the knees are involuntarily flexed. When there is an eruption it usually appears early and consists of dark blotches, from the size of a pinhead to that of a nickel, and is not marked on the extremities.

Where death occurs within 12 hours from the time of attack only a congestion of blood-vessels of the brain and, it may be, of the spinal cord, is generally found. Almost always there is lymph or pus beneath the pia mater, and sometimes serous effusion in the pleura, pericardium or peritoneum. The blood undergoes a change, ecchymoses are found sometimes in the muscles, or in connection with the pericardium or pleura. This disease is best treated with a serum, which was first produced in the monkey but now is successfully derived from the horse. The serum is given in frequent doses depending on the severity of the case, from 12 to 24 hours apart; this treatment has reduced the mortality to 30 per cent. In the chronic variety serum therapy is of no avail; the application of cold to the head should depend upon the desires of the patient. Pain has to be reduced by morphine. Consult Jelliffe and White, 'Diseases of the Nervous System' (3d ed., 1917).

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MENIPPUS, mĕ-nĭp'ŭs, Greek cynic philosopher, a native of Gadara in Palestine, and supposed to have flourished about 260 B.C. His writings were chiefly of a satirical kind. Lucian styles him "the most snarling of cynics," and in two or three of his dialogues introduces him as the vehicle of his own sarcasms. It appears that his satires were composed in verse and prose, on which account those of Varro were denominated Menippean, and for the same reason the name of Satire Ménippée was given in France to the celebrated piece written against the League and Philip II of Spain, its head. His writings are lost.

MENKEN, Adah Isaacs (originally DOLORES ADIOS FUERTES), American actress: b. near New Orleans, La., 15 June 1835; d. Paris, France, 10 Aug. 1868. Making her début with her sister as danseuses, at the New Orleans French Opera House, she was received with marked favor and visited Cuba, Texas and Mexico. On her return to New Orleans, she published a volume of verse and taught French and Latin at a girls' academy in the city. In 1858 she appeared in 'Fazio' in New Orleans, and went to England in 1863–64, assuming the rôle of Mazeppa at Astley's which won her popularity. On 30 Dec. 1866 she played in Paris for 100 nights, and later in Vienna and London. Her last appearance was in Paris in May 1868. She was famous for her fine form, and many marriages and divorces; Alexander I. Menken, John C. Heenan, J. H. Newell and James Barcley being her successive husbands. Her mind seems to have been as winning as her physical beauty, for among her friends were numbered Charles Reade, Dickens, Swinburne and the elder Dumas.

MENNO SIMONS, Dutch religious reformer: b. Witmarsum, Friesland, 1492; d. Oldesloe, Holstein, 19 Jan. 1559. He was ordained priest in the Roman Catholic Church and took pastoral work in the village of Pingium (1524), and from a study of the New Testament, undertaken (1530) to solve his doubts about transubstantiation, he was induced to become an evangelical preacher and finally left the church of his ordination. The martyrdom of Sicke Snyder at Leeuwarden for Anabaptism impelled him to consider the Scriptural grounds for infant baptism. He was finally converted to the cause of the Anabaptists, but never sympathized with the excesses of Münzer and wrote a diatribe against John of Leyden (1535). In 1537 at the request of a number of Anabaptists of Groningen he assumed the functions of an Anabaptist preacher and exercised, by his moderation, a most salutary influence on his fellow-ministers. He now married, his change in faith having superseded his vow of celibacy, and began to travel as an evangelist not only in Friesland but throughout Holland and Germany as far as to Livonia. Being persecuted from place to place he finally settled in Oldesloe in Holstein, where he closed his ministry with the consciousness of having founded a large and flourishing sect, whose subsequent history is related under the title Mennonites (q.v.)

Views of Menno Simons.— Menno was rather a preacher of a system of personal sanctity than either a dogmatist or a violent fanatic like some of the Anabaptists. He was a man of pure moral and devotional enthusiasm, whose account of his own conversion reads like a passage from the 'Confessions' of Augustine. He sums up the results of his labors as consisting in the conversion and recovery of the wicked. Yet he formulated a somewhat vague profession of faith. He believed in the divinity of Christ, who was born on earth *in* Mary, that is without taking upon him human flesh and blood. He rejected infant baptism, and baptized those only who made a personal profession of faith in Christ. He particularly emphasized the power of excommunication possessed by the Church, without which "the spiritual Kingdom of God on earth cannot," he said, "exist in purity and piety." He believed in the coming millennium (q.v.); he excluded civil magistrates from church membership on the ground that the church was a theocracy whose magistrates were the ministers. He declared that war and all taking and administering of oaths were unlawful, and re-

garded human science as useless, even pernicious to a Christian. These decrees, however, as modified by the explanations of Menno, differed little from those generally promulgated by the Reformed bodies of his day. His principal teaching was of a moral and practical character. He was a meek, humble, noble-minded man, carried away with the spirit of his times, encouraging all that was good and pure among his followers, and sternly rebuking the guilty. The best edition of his work is 'Opera Omnia Theologica of al de Godgeleerde werken vann Menno 'Simonis' (1681). Consult Harder, 'Leben Menno Simons' (1846); Roosen, 'Menno Simons den evangelischen Mennonitengemeinden geschildert' (1848).

MENNONITES, a body consisting of a dozen or more branches of followers of Menno Simons, akin to Baptists in faith and practice: Menno Simons (1492–1559), a Holland Anabaptist, was not the founder of the body that bears his name, but was a convert to it several years after it began, and became its chief leader and author. He early left the priesthood of the Roman Catholic Church, espousing the views of the Anabaptists, but opposing the fanatical extremists of Münster. His books were his chief contribution to the movement, which really grew out of the division of Protestantism which is called by the name Anabaptist. The Anabaptists were opposed to the baptism of infants, baptizing only on confession of faith. The followers of Menno Simons became numerous in Holland, Germany and Switzerland, and thousands were persecuted to death, particularly in Holland, because of their views in regard to the temporal power. Rising in the first half of the 16th century (they were first called Mennonites in 1550, though the name was never generally adopted in Europe as it was in America) they increased under persecution and emigrated to Russia and the United States to escape it — to the former country near the close of the 18th century and to the latter from 1640 on, coming from Holland, and Germany to New York and New Jersey. They were drawn to Pennsylvania by William Penn's announcement that those settling in that colony would enjoy freedom in the practice of their religious faith. The Society of Friends in England assisted the Mennonites of Holland to emigrate. The first Mennonite colony was formed at Germantown, near Philadelphia, in 1683. Thence they spread to Lancaster, Bucks, Berks and other counties in Pennsylvania and from that State to other States and to the Canadian provinces. They came in constant contact, in colonial and post-colonial days, with the Indians, but like the Friends, being opposed to bearing arms and inclined to peace they suffered little from attacks by the savages. It is worthy of note that a Mennonite meeting at Germantown as early as 1688 adopted a protest against the traffic in slaves, saying that those "who steal or rob men and those who buy or purchase them" are all alike.

Though Mennonites are widely divided among themselves on questions of practice and principle, they are in substantial agreement in holding doctrines of the evangelical type, as expressed in a declaration of faith adopted at Dort, Holland, in 1632, which confession is generally accepted by the Mennonites of America. They adhere to the principles of autonomy of the churches, freedom of conscience, separation of church and state, adult baptism, non-resistance and practical piety. Baptism is administered on confession of faith, not by immersion, but by pouring, the candidate either kneeling or standing in water and the minister taking up water in both hands and pouring it upon the head, using the scriptural formula. In the ministry there are bishops, or elders, ministers, who are pastors or evangelists, and deacons, who are almoners and assist in administering the ordinances and take charge of congregations in the absence of bishop or minister. Ministers are selected by members of the church, who go one by one to a private room for the purpose. If more than one are thus selected choice between them is made by lot. A bishop has charge of all the churches in his particular district and ordains the ministers and deacons. He is selected in like manner as ministers and deacons. The Lord's Supper is observed twice a year, in the spring and in the fall, preceded by an examination of each member in faith and standing, and followed by the ceremony of feet-washing and the kiss of peace, the sexes separating for this purpose.

Mennonites are opposed to the judicial oath and many practise non-conformity to the world. Their polity provides for the autonomy of the churches, but appeals are taken to the conference. Decisions of conference are submitted to the churches for approval.

The 12 or more branches in America differ so little in some instances that it is difficult to distinguish between them except by name. The census of 1916 reports three bodies in the group not in existence, or not known, in 1906. The distinctive bodies are: (1) Mennonite Church; (2) Conservative Amish; (3) Old Order Amish; (4) Church of God in Christ; (5) Old Order Mennonite (Wisler); (6) Reformed Mennonite; (7) General Conference of Mennonites; (8) Defenceless Mennonites; (9) Mennonite Brethren in Christ; (10) Mennonite Brethren Church; (11) Krimmer Brueder Gemeinde; (12) Hutterian Brethren. There are besides small unattached bodies which may be grouped as miscellaneous, including the Kleine Gemeinde, Stauffer Mennonites, etc.

A historical distinction, which also marks a difference in doctrinal position, may be traced between two European groups and through their descendants in America: (1) Those of Holland, Switzerland and northwestern Germany, and (2) those of Prussia, North Germany and Russia. These emigrated from Holland and used the Dutch tongue until after the middle of the 18th century, when they adopted the German which they still employ. They are of the orthodox type. The first group became liberal or rationalistic and are not in fellowship with the representatives of the second group.

1. Mennonite Church.— This is the largest and oldest body of this faith in America. It is descended from the colony which settled in Germantown. In tendency it occupies middle ground between the stricter and the more liberal schools. Since 1896 it has had a biennial General Conference, composed of dele-

gates elected by the State conferences. The Amish body is represented in this conference — the two churches are practically one — and cooperates in the conduct of the general missionary, educational and benevolent work. The board of missions has missionaries in India and in America, with a department of city missions. The chief educational institution is at Goshen, Ind. Two unincorporated organizations help members who sustain losses by fire, storm, etc., one for Mennonites and Amish, the other for Mennonites and Old Mennonites. The property listed for this purpose aggregates more than $12,000,000. The Mennonite Church is growing in numbers. In 1906 it returned, according to the government census, 18,674 members; in 1916 that number had almost doubled — 34,965. There are 509 ministers and 307 churches in the Middle Western and a few of the Southern States, by far the larger number being in Pennsylvania. *The Mennonite,* of Berne, Ind., is the weekly organ of the denomination in English. There is also a German weekly at the same place.

2. Conservative Amish Mennonite Church. — This is a small body of the Amish type, with only one conference, 14 churches, 30 ministers and 1,066 members, census of 1916. The Amish Mennonites date from 1690, separating from the Mennonites in Switzerland and Alsace on account of their laxness of discipline. The name is derived from Jacob Ammon or Amen, who insisted that the doctrines set forth in the Dort Confession of Faith should be interpreted literally and accepted strictly. In late years this strictness has been relaxed and the main body of Amish is practically reunited with the Old Mennonites in the Mennonite Church.

3. Old Order Amish Mennonite Church. — This body represents the stricter descendants of Jacob Amen and the Swiss Amish of the 18th century. While the main body of Amish were approaching agreement with the main body of Mennonites, the stricter wing were holding the older position resulting in the organization in 1865 of the Old Order Church. This body is opposed to building churches, holding that one place is as sacred as any other and that separate church buildings savor of ritualism. They therefore hold their meetings in private houses, which necessarily makes their congregations small. A Sunday service usually continues about four hours, and is exclusively in German. They use the old hymnal, *Ausbund,* first published for the Swiss brethren in 1571 and reprinted many times in America. The tunes supposed to be the original have never been committed to musical notation and of course never printed. The sermon is without text, and traces God's dealing with the race from Adam down, setting forth the sinfulness of sin and God's love and care for his obedient children. On communion Sundays services are continued from morning till night without intermission, several ministers being in attendance to keep them going. There is no church property, except hymnbooks, plain benches and utensils necessary to the preparation of a plain dinner. Houses and clothing of families, who observe a sort of community life, are very plain, carpets, curtains and wall pictures being forbidden. They have a few Sunday schools and no missionary or benevolent societies, schools or periodicals. They use the ban in discipline, following the example of the original Amish, who in some cases use the extreme penalty of separation of husband and wife. The person against whom the ban was pronounced was cut off from social and family intercourse with all members of the church and was treated as an outcast. The census of 1916 credits the Old Order Amish Church with 7,893 members, an increase of nearly 3,000 in 10 years, 90 churches and 253 Ministers.

4. Church of God in Christ.—A small body of reformers, led by John Holdeman who insisted that the Mennonite Church had forsaken its original foundations. It originated in Ohio in 1859. Holdeman revived the ban as formerly observed in Europe. The body had subsequently considerable accessions of Russian Mennonites, under whose influence the stricter views were gradually relaxed. The census of 1916 credits this body with 17 ministers, 21 churches, and 1,125 members. There has been little change in the first two items since 1906 but the number of members was doubled.

5. Old Order Mennonite Church (Wisler). — Jacob Wisler led a movement in opposition to innovations, such as revival meetings, Sunday schools, etc., which resulted in the organization, in 1870, of the Old Order Church. Other small bodies in Canada, Virginia and elsewhere, which occupied a similar position, joined with the Wisler movement, which holds strictly to the Dort Confession of Faith. The Church has 32 ministers, 22 churches and 1,600 members (census of 1916), each item indicating an advance since 1906.

6. Reformed Mennonite Church.— This branch is also the result of a reform movement toward stricter regard for doctrine and discipline, led by Francis Herr and his son John. The Herrites have no fellowship whatever with other churches, and conduct no Sunday schools or missions. They are decreasing in number. In 1916 they had 26 ministers, 25 churches and 1,281 members, mostly in Pennsylvania.

7. General Conference of Mennonites in North America.— An attempt to unite various Mennonite bodies holding practically the same doctrinal views and observing the same practices, resulted in a general conference in Iowa in 1860, and the organization of this body. Groups of Russian and German churches subsequently joined with it. It is active in missionary and educational work. There are boards of home missions, of foreign missions, of publication, of education and of emergency relief. Three colleges are maintained at Newton, Kan., Bluffton, Ohio, and Freeman, S. D. Several periodicals, including *The Mennonite* weekly, are published at Berne, Ind. The General Conference accepts the Dort Confession, but does not observe the foot-washing ceremony in connection with the Lord's Supper, nor does it require the women to have a head covering during prayers and worship. Its platform of union is acceptance of the Dort Confession, salvation by grace through faith in Christ, baptism on confession of faith, refusal to take oaths, peace, non-resistance and practice of scriptural discipline. The General Conference, which is gaining in numbers, has, according to the census of 1916, 194 ministers, 117 churches and 15,407 members.

8. Mennonite Brethren in Christ.— This branch grew out of an evangelistic effort in Pennsylvania, in 1853. The first conference was formed in 1858. The movement spread and three groups came into existence, which united in 1879; subsequently other groups joined the body which took its present form and name in 1883. There is a general conference which meets every four years, and five district conferences in the United States and two in Canada. A weekly newspaper, *The Gospel Banner,* is published in New Carlisle, Ohio. The General Conference has 95 ministers, 110 churches and 4,737 members.

9. Defenceless Mennonite Church.— A small body of 854 members, which insists upon a definite experience of conversion, organized under the leadership of Henry Egli, in 1860, an offshoot of the Amish branch. It has a mission in Africa and is akin to the conference of Defenceless Mennonites known, until recently, as the Minnesota and Nebraska Conference of Mennonites and now affiliating with the Mennonite Church. (See 1. *Mennonite Church, supra.*)

10. Mennonite Brethren Church.— This body, which was not reported by the census of 1906, has three district conferences in the United States and one in Canada. It conducts home and foreign missions and has a college at Hillsboro, Kan., where it publishes the *Zion's Bote.* The census of 1916 gives this church 81 ministers, 53 churches and 5,127 members.

11. Krimmer Brueder Gemeinde.—A union of two bodies of Brueder Gemeinde, which came originally from Russia, where they separated from the main body of Mennonites, because they were thought to be lax in religious life and discipline. They differ from other Mennonites in baptizing by immersion and not by pouring, and they formerly differed among themselves as to the mode, one group baptizing with a forward, the other with a backward movement. There are 894 members, with 34 ministers and 13 churches.

12. Hutterian Brethren.— These are descendants of the Hutter Brethren of South Russia. Their leader was Jacob Hutter who was burned at the stake at Innsbruck, in the Tyrol, in 1536. The Hutterian Brethren are not strictly Mennonites, but agree with them and are so classed. They formerly observed community life in South Dakota, and have sometimes been called Bruederhoef Mennonites. They have (census of 1916) 982 members, with 32 ministers and 17 churches.

The *Kleine Gemeinde,* the *Stauffer Mennonites* and the *Central Conference* are small groups, differing in minor particulars among themselves and from other Mennonite bodies. They aggregate about 2,500 members. The grand total of Mennonite bodies, according to the census of 1916, is as follows: 1,398 ministers, 840 churches and 79,591 members. The increase in 10 years was nearly 25,000 members.

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MENOBRANCHUS, an alternative designation of *Necturus.* See PROTEIDÆ.

MENOCAL, Aniceto Garcia, American civil engineer: b. Cuba, 1 Sept. 1836; d. 20 July 1908. He was educated in Havana and was graduated from the Rensselaer Polytechnic Institute in 1862. In 1863-69 he was engaged as sub-chief engineer of the Havana waterworks and in 1870 returned to New York, where he was two years in the engineering of the waterworks department. He was chief engineer of all the surveys made for the Isthmian Canal by the United States government and was sent to Paris in 1879 as member of the Canal Congress. He furnished the estimates of the cost of the canal and was a member of the boards for selecting coaling stations in the Philippines, Porto Rico and on the coast of Liberia, Africa. He was a member of several scientific societies and published many of his official reports, etc.

MENOMINEE, the French FOLLES AVOINES, a tribe of North American Indians of Algonquian stock, formerly known in upper Michigan and Wisconsin, along the Menominee River and Green Bay, and ranging west to the Mississippi and south to the Fox River. Their name signifying "wild-rice men," hence the French translation is derived from their use as a staple food of the abundant wild rice of the region. Their descendants numbering about 1,400, civilized and Roman Catholics, inhabit Green Bay Reservation, Wisconsin. Consult Hoffman, J. W., 'The Menominee' (in Bureau of American Ethnology, 14th Annual Report, Washington, 1896).

MENOMINEE, mē nŏm'ĭ-nē, Mich., city, county-seat of Menominee County, at the mouth of Menominee River, on Green Bay, and on the Chicago, Milwaukee and Saint Paul, the Wisconsin and Missouri and the Chicago and Northwestern railroads, opposite Marinette (q.v.), at the southern point of the Northern Peninsula, and about 46 miles northeast of the city of Green Bay, Wis. The first settlement was made in 1799 by Louis Chappieu, a French fur trader. The first lumber mill was built in 1832, but the town was not incorporated until 1883. It is situated in an extensive lumbering region, and it is one of the largest lumber-shipping ports on the Great Lakes. Its chief industries are connected with the lumbering interests, and its great sawmills have an annual capacity of 275,000,000 feet. The principal manufactures are lumber in all forms, paper, shoes, boxes, machinery, telephones, steam-boilers, beet-sugar, electrical machinery, auto trucks and lumbering camp outfits. The city has an agricultural college, a fine high school, public and parish schools and a public library which contains about 5,000 volumes. It has Saint Joseph's Hospital, the county buildings and several fine churches. The government is vested in a mayor and council elected annually. The city treasurer and the justice of the peace are elected by the people; the other adminis-

trative officers are chosen by the mayor and council. Pop. 10,507.

MENOMINEE RANGE. See IRON ORE, *Iron Ore Districts.*

MENOMONIE, Wis., city, county-seat of Dunn County, on the Red Cedar River, and on the Chicago, Saint Paul, Missouri and Ohio and the Chicago, Milwaukee and Saint Paul railroads, about 65 miles east of Saint Paul, Minn. It is in an agricultural region and near the lumber section of the State. The chief manufactures are lumber, wagons, carriages, machinery, foundry products, bricks, pianos and flour. The trade is principally in lumber, pianos, flour, brick, Menomonie is the seat of the Stout Institute, a State institution for the teaching of trades and for the preparation of teachers of industrial arts and household arts. It has a county training school for the preparation of rural school teachers, and a County Agricultural School. It has the Mabel Tainter Memorial Library, which contains about 18,000 volumes. The Dunn County Asylum is near, but just outside the city limits. Pop. 5,036.

MENOPAUSE, the cessation of menstrual flow in women; climacteric. This epoch is reached generally between the 45th and 52d years, and is frequently marked by nervous disturbances. The power of child-bearing terminates at the menopause. It is popularly termed the "change of life." A woman who begins child-bearing early and gives birth to a large family usually has her menopause earlier than a childless woman. The approach of the menopause is marked by irregular — usually delayed — menstruation, and sometimes the latter flows are very profuse and weakening. See CLIMACTERIC; MENSTRUATION, DISORDERS OF.

MENOPOME, a giant salamander of the genus *Cryptobranchus* (formerly (*Menopoma*). See HELLBENDER.

MENPES, Mortimer, English artist: b. Adelaide, South Australia, 1859. He went to London when 19, studied at South Kensington; spent three years in Brittany at Pont Aven; traveled in Japan, where he learned something from Kyosai, in India, Burma and Cashmere, then through southern Europe and Mexico; and wherever he went continued his early experiments in color and his attempts to reproduce the atmosphere of various localities. Originally he used the color as dry as possible, then mixed it with petroleum and finally used poppy-oil as a medium. He revived the lost art of printing in color from etched plates; made some excellent dry paint etchings, notably one of Hals' 'Archers of Saint Adrian,' and published several volumes of pictures. His English house was made in the East, and is a wonderful piece of Oriental workmanship in gold and black. He has published 'World Pictures' (1902); 'Whistler as I Knew Him' (1904); 'India' (1905); 'Sir Henry Irving' (1906).

MENSA, or MONS, *in astronomy,* one of the 14 constellations which Lacaille discovered at the Cape of Good Hope. It is named from the mountain which is a conspicuous feature of the landscape at the Cape. The constellation is a very inconspicuous one near the South Pole, its brightest star being only of 5.3 magnitude.

MENSTRUATION, the periodical discharge of the menses or bloody fluid from the female generative organs. In women it normally occurs at intervals of one lunar month, or 13 times a year (hence the use of the term *menses,* Latin plural of *mensis,* month). Its first appearance marks the stage of puberty, and is usually attended by definite changes — enlargement of the breasts, showing development of the mammary glands, growth of the ovaries, of the uterus and external genital organs, etc., and by other signs, physical and mental, of approaching womanhood and maturity. It usually begins in temperate climes between the 13th and 15th year; in hot climates it is apt to commence as young as 12 years, and in very cold climates as late as 17 years; its periodic recurrences continue until the menopause (q.v.) or final cessation of the discharge, which ordinarily arrives somewhere between the 45th and 52d years. The recurrent periods of its appearance, as well as their duration, vary with different females, and not infrequently in the same individual; the variations, however, not always indicating abnormal or pathological causes. The immediate cause of menstruation is the breaking away of an ova or egg from one of the ovaries. (See OVARY.) Menstruation is often at first, and in many persons throughout the catamenial age, attended by characteristic pains and symptoms, with physiological and psychological conditions of disturbance or depression, which sometimes call for special hygienic treatment. During pregnancy (with exceptional cases) there is no menstrual flow, its cessation being one of the earliest signs of conception. Observance of wholesome rules of exercise, rest, etc., helps to maintain normal conditions of body and mind, the reverse of which, owing to neglect of such rules, so often makes the menstrual function a visitation of dread and distress.

Disorders of Menstruation. — These include amenorrhœa, dysmenorrhœa, menorrhagia and metrorrhagia. Amenorrhea is an absence of the menstrual flow from some cause other than pregnancy or the approach of the menopause (q.v.) or tardy establishment of the menstrual function. It is a symptom of anæmia (q.v.), or may be due to a constitutional condition such as profound nerve-fag or tuberculosis. Strychnine, iron and ergot may be administered internally, or the physician may apply local treatment. (See DYSMENORRHŒA). Menorrhagia is an abnormally profuse flow during the menstrual period, due to one of several conditions. If not checked by rest, a physician is necessary, as also in metrorrhagia, which is a sanguineous flow between the menstrual periods.

MENSURAL MUSIC. Mensural or measured music is a term applied to a historical style of composition in which the tones bore exact relations to each other in regard to length or time. Such a designation and the occasion for it may appear strange, as precise rhythm seems to belong to the essence of music. This, however, is not the case: there was a period when notes were not exactly measured, and mensural music is a subsequent development from this early practice.

All European music of a higher character

was originally cultivated in connection with speech or poetry. This is true of the music of the Greeks as well as the early Christians. But speech is not necessarily rhythmical. Ordinary speech is not so at all, and even poetry is not always characterized by the exact time relations typical of strictly measured music. A trochee can be delivered either in two or three part time, the accented syllable matching the unaccented in duration or requiring double as much time. And in impassioned utterance rhythmical relations are apt to be lost sight of altogether. Moreover, any rhythm which the accompanying tones may possess would be theirs only by virtue of the words to which they are added: it would be a rhythm of the poetry, not of the music.

Such was the case in Greek music. Although instrumental performances were also in vogue among the Greeks, music with them, as we have said, was primarily vocal. We know little of its exact character, but are probably justified in regarding it as a species of recitative, the words guiding the course of the tones. In Christian times the earliest fixed type of the art was the Ambrosian chant, formulated by Saint Ambrose of Milan in the 4th century. This, too, was similar to Greek music in its adherence to the rhythm of the words. A change was wrought by Pope Gregory the Great, two centuries later. What distinguishes his chant from the Ambrosian is supposed to be the uniform length of its tones, giving it a character similar to that of our choral. However, this is probably true only in part. According to the historian Ambros, the sections of the chant which were sung by many voices may have been measured and regular, but the utterances of the priest must have retained much rhythmical variety. The real difference is formulated by him as follows: "The Ambrosian chant was based essentially on the poetical metre, the Gregorian on the musical." Whatever the exact nature of the difference, however, there is no doubt that Gregory effected a liberation of the tones from the rhythmical shackles of the words. And this was a gain of far-reaching importance. Music had now won its independence, and the way was prepared for the development of mensural composition.

The more immediate occasion for this development was the introduction of harmony. Just as music had primarily been vocal, so also it had been unisonal in character. Though a second tone may occasionally have been added to the principal part, nothing like the later polyphony was attempted. In the 9th century, however, the so-called Organum of Hucbald makes its appearance. In this the theme is systematically accompanied by one, two or three other voices, singing intervals of a fourth, fifth and octave in parallel motion. The point was now reached beyond which no further advance was possible without an exact designation of the length of the notes. As long as the singing had been confined to a single person this was not necessary. Nor was it necessary in the case of several persons chanting in unison, if the length of the notes was regulated by the natural accent of the words, or if all the tones were of equal length. In the Organum, however, a certain care was already required. The singers had to stand so that they could see as well as hear each other, and one among them acted as leader, introducing the new notes at the proper moment. The Organum now developed in various directions. There was a more independent progression of parts, contrary alternating with parallel motion, and the tones no longer coincided with each other note for note, but one voice sang two or more tones while the other sang one. Manifestly this required an understanding as to the relative duration of the tones, and a method of designating the differences graphically. The first person to formulate the solution of this problem was Franco of Cologne, who lived about the year 1200. Previous to him tones of two lengths, the longa and brevis, had already been recognized. He also admitted the duplex longa or maxima,— twice as long as the longa, and the semi-brevis,— half as long as the brevis. The notes in question were represented as follows:

Rests were also indicated by Franco, by means of appropriate signs. The bar-line was not yet in use, but measure was recognized, being at first confined to triple or "perfect" time. Duple or "imperfect" time was only permitted at a later date.

There were many complexities in the system as promulgated by Franco and his followers. Thus the length of the notes was not only determined by their own character and appearance, but also depended on the neighboring notes. There were "alterations" and "imperfections," "prolations" and "ligatures," but space will not permit us to enter into all these involved details, which have only a remote historical interest. The rules governing mensural music were further elaborated — among other writers — by Marchettus of Padua, who lived about a century after Franco; and Jean de Muris, a celebrated theoretician of the 14th century. Notes of shorter duration were gradually introduced, such as the minima, semiminima, fusa and semi-fusa. And the notation too was modified, until it finally assumed the appearance to which we are accustomed to-day. Together with the Organum, mensural music furnished the basis for all subsequent advances in the art. It was the indispensable prerequisite for the growth of rhythmical and contrapuntal variety. It made possible the wonderful development in part writing which was soon to take place in the Netherlands, and which was eventually to lead to the glories of modern instrumental and choral music. In fine, it may be regarded as one of the two or three great elementary contributions to the art, on which the dazzling superstructure of modern beauty and inspiration has been erected.

ALBERT GEHRING,
Author of 'The Basis of Musical Pleasure,' etc.

MENSURATION. Mensuration is that branch of applied mathematics which treats of the metrical relations of geometric figures, in particular of the length of lines, the magnitude of plane and solid angles, the area of surfaces and the volume of solids. The term is used both for the act and for the art of measuring geometric magnitudes. Mensuration is not usually treated as a separate branch of mathe-

matics, but occurs as an integral part of various subjects, such as plane geometry, solid geometry, trigonometry and integral calculus. For a discussion of the measurement of plane, diedral, spherical and solid angles and of the relations between the sides and angles of a triangle (plane or spherical) the reader is referred to the article on TRIGONOMETRY. The present article will give formulas for lengths, areas and volumes of the simpler and the regular figures and methods of approximation for the more complex or irregular figures.

The measure of a geometric magnitude is its ratio to a fixed magnitude of the same kind selected as the unit of measurement. Throughout this article the unit of area is assumed to be a square each side of which is equal to the unit of length, and the unit of volume is a cube whose edges are likewise of unit length. The purpose of a formula is to show how one of these numbers (ratios) may be found from certain others which are supposed to be known or obtainable. Thus formula (XIX) says that the ratio of the area of a circle to that of a square each side of which is a foot long (that is, the area of the circle measured in square feet) may be obtained by multiplying together the ratio of the circumference to the unit of length known as a foot, the ratio of the radius to the same unit of length, and the number ½. It is important to recognize that in using any formula the units must all be of the same system. The number of acres in a field cannot be found directly from formula (X) by multiplying together the number of rods in two adjacent sides: this would give the number of square rods in the field. Nor is the number of gallons in a barrel given by formula (LXV) when the radii are measured in feet or in inches, but the number of cubic feet or cubic inches, as the case may be. In order to change any measure from one system of units to another the following table may be found useful:

To change		Multiply by	Inverse
in.	to cm.	2.53998	.393704
ft.	to m.	.304797	3.28087
miles	to km.	1.60933	.621377
sq. in.	to sq. cm.	6.45148	.155003
sq. ft.	to sq. m.	.0929013	10.7641
sq. ft.	to acres.	.0000229568	43560.
sq. yds.	to acres.	.000206612	4840.
sq. miles	to acres.	640.	.0015625
cu. in.	to cu. cm.	16.3866	.0610254
cu. ft.	to litres.	28.3161	.0353156
cu. in.	to gallons.	.004329	231.
cu. cm.	to gallons.	.000264184	3785.238

[in.= inches, ft.= feet, yds.= yards, sq.= square, cu.= cubic, m.= meters, cm.= centimeters, km.= kilometers].

(For other multipliers see WEIGHTS AND MEASURES). The second column of figures serves to change the unit in the opposite way to that indicated by the rest of the table: thus to change meters to feet multiply the number of meters by 3.28087; for instance, 10 meters is equal to 32.8087 feet.

In many cases the computation of area or of volume may be accomplished most easily by mechanical means. For the measurement of the area of plane figures ingenious and effective instruments known as planimeters have been invented. Two historic instances are the finding by Galileo of an approximate value for the area of a cycloid by cutting it out of a sheet of copper and weighing the model, and the discovery by Archimedes of a fraud in Hiero's new crown through measuring its volume by submersing it in water and measuring the water displaced. To apply this last method, multiply the number of ounces of water by 1.73, or less accurately by $\frac{7}{4}$, and the result will be the number of cubic inches in the object; or, measure directly the volume of the water displaced.

LENGTH OF LINES.

Circle.— The *circumference* of a circle is equal to the diameter multiplied by

3.14159265358979323846264338328 . . . . . .

This constant is usually denoted by the Greek letter π (pī) and is approximately equal to

$3\frac{1}{7}$, $\frac{355}{113}$, or 3.1416.

Use the first if an error of one two-thousandth of the final result may be neglected, and the last if an error of one four-hundred-thousandth is negligible.

The above theorem may be written

$$l = \pi d, \qquad = 2\pi r, \tag{I}$$

where l = length of circumference, d = diameter and r = radius.

The length l of the arc AMB in Fig. 1, in which MD is the perpendicular at the middle point of the chord AB, AE is tangent to the circle at A or perpendicular to the radius OA. OE is perpendicular to AM, the chord of half the arc or the angle AOE is one-fourth of the angle AOB, may be found by any one of the formulas

$$l = \frac{\pi}{180} dr, \quad \frac{\pi}{180} = \frac{1}{57} \quad \text{(error about } \tfrac{1}{31}\text{)} \tag{II}$$

$$l = c + \frac{8}{3}\frac{h^2}{c}, \tag{III}$$

$$l = 2k + \tfrac{1}{3}(2k - c), \tag{IV}$$

$$= \tfrac{1}{3}(8k - c),$$

$$l = t + s, \tag{V}$$

in which d = number of degrees in the angle AOB, r = radius OA, c = chord AB, h = height MD, k = chord of half the arc AM, t = length

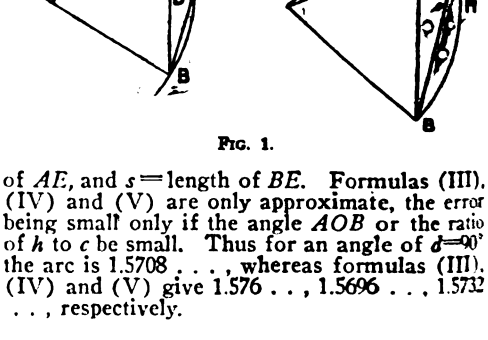

FIG. 1.

of AE, and s = length of BE. Formulas (III), (IV) and (V) are only approximate, the error being small only if the angle AOB or the ratio of h to c be small. Thus for an angle of d=90° the arc is 1.5708 . . . , whereas formulas (III), (IV) and (V) give 1.576 . . , 1.5696 . . . , 1.5732 . . , respectively.

Parabola.—The length l of the arc AVB of the parabola in Fig. 2 is

$$l=\sqrt{y^2+4x^2}+\frac{y^2}{2x}\left(\log\frac{2x+\sqrt{y^2+4x^2}}{y}\right)\ldots, \quad \text{(VI)}$$

where $x=VD$, $y=AD$, and the logarithm is taken to the base e.

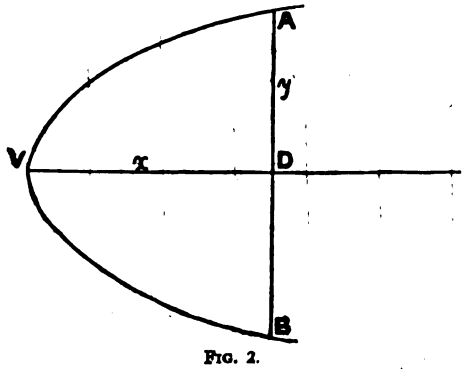

FIG. 2.

Ellipse.—The length l of the circumference $ABA'B'$ of ellipse in the next figure (Fig. 3), in which F and F' are the foci ($BF=BF'=OA$), is

$$l=2\pi a\left(1-\tfrac{1}{4}e^2-\tfrac{3}{64}e^4-\tfrac{5}{256}e^6\ldots\right), \quad \text{(VII)}$$

or approximately

$$l=\pi\sqrt{2(a^2+b^2)} \quad \text{(VIII)}$$
$$=4.443d;$$

where e is the eccentricity $\left(OF/OA=\frac{1}{a}\sqrt{a^2-b^2}\right)$; $a=OA$, one-half the longest diameter; $b=OB$, one-half the shortest diameter; $d=AB=\sqrt{a^2+b^2}$.

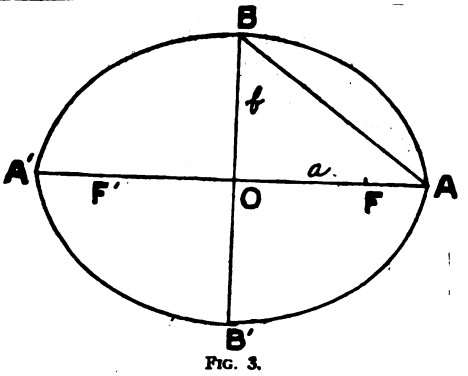

FIG. 3.

General Methods of Approximating the Length of Any Curved Line.—Divide the line into parts each of which differs but little

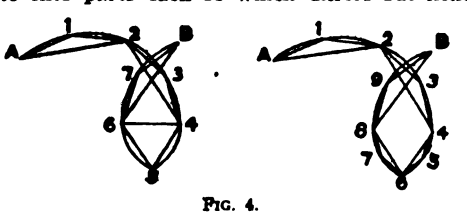

FIG. 4.

from a small circular arc. Then each portion may be found by any one of the formulas (III), (IV) or (V). A convenient method for the use of formula (IV) is indicated by the diagram herewith (Fig. 4) and formula (IX). The only restrictions upon the location of the points 1, 2, 3, 4, . . . in addition to that given above is that the odd-numbered ones must be half-way between the others and that there should be an odd number of points in all.

$$l=(\overline{A1}+\overline{12}+\overline{23}+\ldots)+\tfrac{1}{3}[(\overline{A1}+\overline{12}+\overline{23}+\ldots)-(\overline{A2}+\overline{24}+\overline{46}+\ldots)]. \quad \text{(IX)}$$

AREA OF PLANE FIGURES.

Rectangle.—The area a of a rectangle, the lengths of two adjacent sides of which are b and c respectively, is

$$a=bc. \quad \text{(X)}$$

Triangle.—The area a of the triangle ABC (Fig. 5) is

$$a=\tfrac{1}{2}hb, \quad \text{(XI)}$$
$$a=\tfrac{1}{2}bc\sin A, \quad \text{(XII)}$$
$$a=\sqrt{s(s-a')(s-b)(s-c)}, \quad \text{(XIII)}$$

or

$$a=\tfrac{1}{2}b^2\frac{\sin A\cdot\sin C}{\sin(A+C)}; \quad \text{(XIV)}$$

where a', b, c are the lengths of the sides BC, CA, AB, respectively; h is the perpendicular distance (height) of B from AC; s is one-half of the sum of the sides: $s=\frac{1}{2}(a'+b+c)$.

If one angle of the triangle (say A) is a right angle, both formulas (XI) and (XII) simplify: namely, the era is one-half the product of the two sides which enclose the right angle ($a=\frac{1}{2}bc$). For a simple method of finding the area of an equilateral triangle. ($a'=b=c$) multiply the square on one side by $\frac{13}{20}$ ($a=\frac{13}{20}b^2$, approximately), see formula (XVIII).

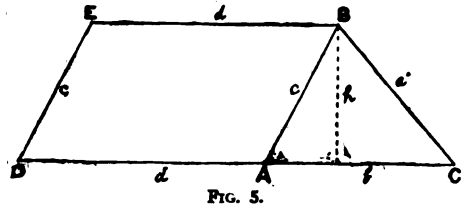

FIG. 5.

Parallelogram.—The area a of the parallelogram $ABED$ (Fig. 5) is

$$a=d\,.\,h, \quad \text{(XV)}$$

or

$$a=cd\sin D, \quad \text{(XVI)}$$

where c and d are the lengths of two adjacent sides, D is the angle between them, and h is the perpendicular distance between the two parallel sides whose length is d.

Trapezoid.—The area a of the trapezoid $CBED$ (Fig. 5), any four-sided figure with two of the opposite sides (BE and DC) parallel, is

$$a=\tfrac{1}{2}h(d+e), \quad \text{(XVII)}$$

where h is the perpendicular distance between the two parallel sides and d and e are the lengths of the parallel sides ($d=BE$, $e=DC$).

Regular Polygon.—The area a of a polygon bounded by n equal sides each of length s and having its n angles all equal is

$$a=s^2\times\frac{n\cot\frac{180^\circ}{n}}{4}. \quad \text{(XVIII)}$$

The following table gives (approximately) the value of the multiplier in the simpler cases:

NAME	n	$\frac{n \cot \frac{180°}{n}}{4}$
Triangle	3	.433013
Square	4	1.
Pentagon	5	1.72048
Hexagon	6	2.59808
Heptagon	7	3.63391
Octagon	8	4.82843
Nonagon	9	6.18182
Decagon	10	7.69421
Undecagon	11	9.36564
Dodecagon	12	11.19615

Thus, for instance, if the side of a regular hexagon be 9 feet, its area is $81 \times 2.59808 = 210.4445$.

Irregular Polygon.— The area of an irregular polygon may be found by dividing it into parts each of which is a triangle, parallelogram, rectangle or trapezoid. Thus if we draw a system of parallel lines across the polygon, one through each vertex, each part will be a triangle or trapezoid and its area may be found by formulas (XI) or (XVI).

Circle.— The area a of a circle, whose radius is r and whose circumference is l, is

$$a = \tfrac{1}{2}lr, \qquad \text{(XIX)}$$

or $a = \pi r^2$, $\pi = 3.1416 = \frac{22}{7}$ (nearly). (XX)

The area a of the sector $OAMB$ (Fig. 1), in which l is the length of the arc AMB and d is number of degrees in the angle AOB, is

$$a = \tfrac{1}{2}lr, \qquad \text{(XXI)}$$

or $a = \frac{\pi}{90}dr$, $\frac{\pi}{90} = .034906585 = \frac{1}{28.65}$ (nearly).

The area a of the segment $AMBD$ (Fig. 1) is

$$a = \tfrac{1}{2}r(l - r \sin d°), \qquad \text{(XXII)}$$

$$a = \tfrac{2}{3}ch + \frac{h^3}{2c} \text{ (approximately)}, \qquad \text{(XXIII)}$$

or

$$a = \tfrac{2}{3}ch \text{ (approximately)}, \qquad \text{(XXIV)}$$

where r, l, c, h, d have the same meanings as in formulas (II), (III), (IV) and (V).

Parabola.— In Fig. 2 the area a of the segment $VABD$ with base $AB = 2y$ and height $VD = x$ is

$$a = \tfrac{2}{3}xy. \qquad \text{(XXV)}$$

Ellipse.— In Fig. 3 the total area a' of the ellipse $ABA'B'$, of which the length of the longest diameter $A'A$ is $2a$ and the length of the shortest diameter BB' is $2b$, is

$$a' = \pi ab, \quad \pi = 3.1416 \qquad \text{(XXVI)}$$

General Methods of Approximation.— Any plane area can be divided into parts each of which is a rectangle or differs from a rectangle in that one side is a simple curve as in Fig. 6. It is therefore sufficient to give methods by which an area, such as $ABB'A'$ following, may be measured.

1. The Trapezoidal Method.— Divide the base line AB into any number of equal parts, AP, PQ, QR, . . . , TB and erect the perpendiculars PP', QQ', . . . , TT'. Then if each portion $A'P'$, $P'Q'$, ... , $T'B'$ of the curve $A'B'$ is nearly coincident with its chord, the area a is

$$a = \overline{AP}[(\overline{AA'} + \overline{PP'} + \overline{QQ'} + \ldots + \overline{TT'}) - \tfrac{1}{2}(\overline{AA'} + \overline{BB'})]. \qquad \text{(XXVII)}$$

2. Simpson's Rule.— Divide the base line into any *even* number of parts (in Fig. 6 it is

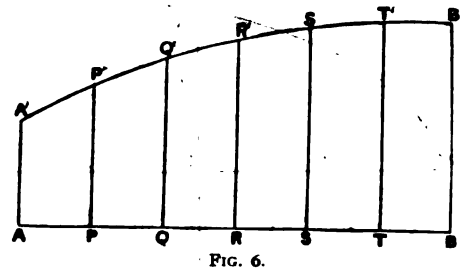

FIG. 6.

divided into six parts); erect the perpendiculars as before. Then

$$a = \tfrac{1}{3}\overline{AP}[\overline{AA'} + \overline{BB'} + 2(\overline{QQ'} + \overline{SS'} + \ldots) + 4(\overline{PP'} + \overline{RR'} + \overline{TT'} + \ldots)]. \qquad \text{(XXVIII)}$$

3. Weddle's Rule.— Divide the base into exactly *six* equal parts (as in Fig. 6), then

$$a = \tfrac{3}{10}\overline{AB}[5(\overline{PP'} + \overline{RR'} + \overline{TT'}) + \overline{RR'} + \overline{AA'} + \overline{QQ'} + \overline{SS'} + \overline{BB'}]. \qquad \text{(XXIX)}$$

SURFACE AND VOLUME OF SOLIDS.

Prism.— This includes any solid two of whose faces, known as the *bases*, are equal polygons situated in parallel planes and all the other faces, the *lateral* faces, are parallelograms. Thus in the following diagram (Fig. 7) the polygons ABC . . . and $A'B'C'$ . . . are the bases and the parallelograms $AA'B'B$, $BB'C'C$, . . . are the lateral faces. The edges AA', BB', CC', . . . are the lateral edges. The polygon UVW . . . lying in a plane perpendicular to one, and so to all, of the lateral edges is called a *right section*. The right section is equal to the base if and only if the lateral edges are perpendicular to the base.

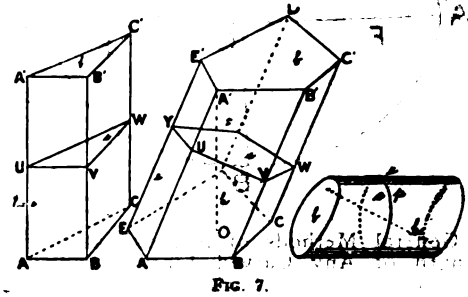

FIG. 7.

For the lateral area a which is the sum of the lateral faces $AA'B'B$, $BB'C'C$ . . . , and the volume v of a prism we have the formulas

$$a = e(\overline{UV} + \overline{VW} + \ldots), \qquad \text{(XXX)}$$

$$v = es, \qquad \text{(XXXI)}$$

$$v = hb, \qquad \text{(XXXII)}$$

in which e = length of a lateral edge (AA' or BB' . . .), s = area of a right section (UVW . . .), h = height, i.e., distance between bases, b = area of a base.

The volume v of a *truncated triangular prism*, that is one with three lateral faces and

whose bases are not parallel (therefore the lengths e_1, e_2, e_3 of the lateral edges not equal) is

$$v = \tfrac{1}{3}s(e_1+e_2+e_3). \qquad \text{(XXXIII)}$$

Any truncated prism may be divided into truncated triangular prisms and its volume thus found. For a four-sided prism whose opposite lateral faces are parallel this gives

$$v = \tfrac{1}{2}(e_1+e_2)s, \qquad \text{(XXXIV)}$$

where e_1, e_2 are a pair of opposite edges.

Cylinder.— This includes any solid having two *bases* which are equal plane figures bounded by curved lines (such as circles, ellipses or irregular figures), and situated in parallel planes, and the rest of the surface of the solid such that it may be thought of as consisting of an infinite number of parallel straight lines. If we call the length of each of these (equal) parallel lines e, the formulas for the prism given above (XXX, XXXI, XXXII) apply also to the cylinder, namely, the lateral area a and the volume v are

$$a = ep, \qquad \text{(XXXV)}$$
$$v = es, \qquad \text{(XXXVI)}$$
$$v = hb, \qquad \text{(XXXVII)}$$

where p is the length of the boundary, and s is the area of the section of the cylinder by a plane perpendicular to one of the lines lying on the lateral surface.

If the right section of a cylinder be a circle, the base, unless a circle, is an ellipse and its area is found by formula (XXVI). If in such a circular cylinder the bases are not parallel and the distance between the centres of the bases is l, then the area a and the volume v are

$$a = lp, \qquad \text{(XXXVIII)}$$
$$= 2\pi rl, \qquad \text{(XXXIX)}$$
$$v = ls, \qquad \text{(XL)}$$
$$= \pi r^2 l, \quad \pi = 3.1416, \qquad \text{(XLI)}$$

where r is the radius of the right section. These formulas are equivalent to (XXXV) and (XXXVI) when the bases are parallel, since then $l = e$.

Pyramid and Cone.— The volume v of any solid, such as those in Fig. 8, whose sur-

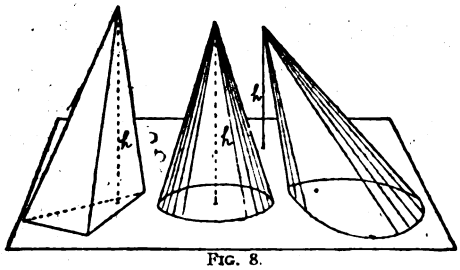

FIG. 8.

face consists of a base, which is a plane figure of *any* kind, triangle, polygon, circle, ellipse, etc., and of triangles or curved areas which may be thought of as composed wholly of straight lines, joining the boundary of the base to some point (the vertex) not in the same plane as the base, is

$$v = \tfrac{1}{3}bh, \qquad \text{(XLII)}$$

where b is the area of the base and h is the perpendicular distance (height) of the vertex from the plane of the base.

For a right circular cone, that is one in which the base is a circle and the line joining the vertex to the centre of the base is perpendicular to the plane of the base, the area a of the curved (lateral) surface is

$$a = \pi re, \quad \pi = 3.1416 \qquad \text{(XLIII)}$$

where r is the radius of the base and e is the distance from the vertex to any point in the circumference of the base.

Prismatoid.— The volume v of any solid, whose total surface consists of two plane figures (the *bases*), of any character whatever, lying in parallel planes, and a lateral surface made up of triangles, trapezoids, or curved portions which may be thought as made up of straight lines joining the boundaries of the bases, is

$$v = \tfrac{1}{6}h(b_1+b_2+4m), \qquad \text{(XLIV)}$$

where h is perpendicular distance (height) between the bases, b_1 and b_2 are the areas of the bases, and m is the area of a section of the solid by a plane parallel to and half-way between the planes of the bases; or

$$v = \tfrac{1}{6}h(b + 3q), \qquad \text{(XLV)}$$

where b is one of the bases and q is the area of a section parallel to and two-thirds of the way from, that base to the other.

Solids of Revolution. Sphere.— The area s of the surface and the volume v of a sphere of radius r are

$$s = 4\pi r^2, \quad 4\pi = 12.56637 \ldots \qquad \text{(XLVI)}$$
$$v = \frac{4\pi}{3}r^3, \quad \frac{4\pi}{3} = 4.18879 \ldots \qquad \text{(XLVII)}$$

The volume v and lateral area a of a *segment* of a sphere (that is the part lying between two parallel planes) are

$$v = \frac{\pi}{6}h[h^2+3(r_1^2+r_2^2)], \quad \frac{\pi}{6} = .5236 \ldots \qquad \text{(XLVIII)}$$
$$a = 2\pi hr, \qquad \text{(XLIX)}$$

where h is the height of the zone (perpendicular distance between the parallel planes of the bases), r_1 and r_2 are the radii of the bases respectively, r is the radius of the sphere.

Spheroid.— For a *prolate* spheroid, that is the solid formed by revolving an ellipse about its longest diameter (in Fig. 3, about AA'), the area s of the surface and the volume v are

$$s = 2\pi\left(b^2 + \frac{ab}{e}\sin^{-1}e\right), \qquad \text{(L)}$$

or $s = 2\pi b(b+fa)$, (approximately) (LI)

where a, b and e have the same significance as in (VII) and (VIII) and

$$f = 1+\tfrac{1}{6}c+\tfrac{3}{40}c^2+\tfrac{5}{112}c^3+\tfrac{35}{1152}c^4+\tfrac{63}{2816}c^5+\ldots,$$

in which $c = 1-\frac{b^2}{a^2}$. Or less accurately

$$s = \frac{\pi}{3}b\left[7a+b\left(6-\frac{b}{a}\right)\right], \quad \frac{\pi}{3} = 1.0472; \qquad \text{(LII)}$$

$$v = \frac{4\pi}{3}ab^2, \quad \frac{4\pi}{3} = 4.18879 \ldots \qquad \text{(LIII)}$$

The volume v of a *segment* of a prolate spheroid (part cut off by a plane perpendicular to the axis of revolution) the height of which is h, is

$$v = \frac{\pi}{3}h^2\frac{b^2}{a^2}(3a-h), \quad \frac{\pi}{3} = 1.047198 \ldots \qquad \text{(LIV)}$$

For an *oblate* spheroid, that is the solid formed by revolving an ellipse about its short-

est diameter (in Fig. 3, about BB') the corresponding formulas are

$$s=\pi\left(2a^2+\frac{b^2}{e}\log\frac{1+e}{1-e}\right), \quad \text{(LV)}$$

or $$s=2\pi(a^2+gb^2), \quad \text{(LVI)}$$

where

$$g=1+\tfrac{1}{3}d+\tfrac{1}{5}d^2+\tfrac{1}{7}d^3+\tfrac{1}{9}d^4+\tfrac{1}{11}d^5+\ldots,$$

in which $$d=1-\frac{b^2}{a^2};$$

$$v=\frac{4\pi}{3}ba^2, \quad \frac{4\pi}{3}=4.18879\ldots \quad \text{(LVII)}$$

The volume v of a segment of an oblate spheroid is

$$v=\frac{\pi}{3}h^2\frac{a^2}{b^2}(3b-h). \quad \text{(LVIII)}$$

Paraboloid.— The volume v of the solid formed by revolving VAD in Fig. 2 about VD as an axis is

$$v=\frac{\pi}{2}xy^2, \quad \frac{\pi}{2}=1.5708\ldots, \quad \text{(LIX)}$$

which is just one-half the volume of the circumscribing cylinder.

The General Solid of Revolution.— The volume v of the solid formed by revolving any curve about a line lying in the same plane and not intersecting it, for instance by revolving $A'B'BA$ in Fig. 6 about AB as an axis, is

$$V=\frac{\pi}{3}.\overline{AP}[\overline{AA'}^2+\overline{BB'}^2+2(\overline{QQ'}^2+\overline{SS'}^2+\ldots)+4(\overline{PP'}^2+\overline{RR'}^2+\ldots.)]. \quad \text{(LX)}$$

Or, as it is perhaps usually easier to measure the circumferences of the circles generated by PP', etc., than their diameters, if we denote the circumferences generated by A', P', $Q'\ldots.$, B' by a, p, $q,\ldots$, b, respectively, the above formula may be written

$$v=\frac{1}{12\pi}.\overline{AP}[a^2+b^2+2(q^2+s^2+\ldots)+4(p^2+r^2+\ldots)],$$

$$\frac{1}{12\pi}=.0265258\ldots \quad \text{(LXI)}$$

The Regular Solids.— The area of the surface and the volume of the five regular solids may be found by means of the multipliers given in the following table:

NAME	Area = (edge)$^2\times$	Volume = (edge)$^3\times$
Tetrahedron	1.7320508	.1178511
Cube	6.	1.
Octahedron	3.4641016	.4714043
Dodecahedron	20.6457788	7.6631189
Icosahedron	8.6602540	2.1816950

(LXII)

General Method.— The volume of solids which do not come under any of the types treated above may be measured by an application of the prismatoidal formula (XLIV). Let $a_1, a_2, a_3, \ldots, a_m, a_{m+1}$ be the areas of a set of plane sections parallel to a suitably chosen base and dividing the solid into an even number $(2n)$ of portions; a_1, a_{m+1} being the end sections (that is, the solid lies wholly between a_1 and a_{m+1}). The distance between consecutive cutting planes is to be the same throughout and to be taken so small that between the odd-numbered sections the solid is approximately a prismatoid. The area of a section may be found by surrounding it by a rectangle and measuring (by XXVII, XXVIII or XXIX) the portion of the rectangle outside of the section. If the distance between the sections be h, then

$$v=\tfrac{1}{12}h[a_1+a_{m+1}+2(a_3+a_5+a_7\ldots+a_{m-1})+4(a_2+a_4+a_6\ldots+a_m)]. \quad \text{(LXIII)}$$

Barrel.— If d be the inside diameter of the end of a barrel, c the inside diameter at the middle, and l the length (or height) of the barrel, then the prismatoidal formula (XLIV) gives as the volume v

$$v=\frac{\pi}{6}l\left(\frac{d^2}{2}+c^2\right), \quad \frac{\pi}{6}=.5236. \quad \text{(LXIV)}$$

The following is said to be a better approximation:

$$v=\frac{\pi}{9}l\left(d^2+\frac{5}{4}c^2\right), \quad \frac{\pi}{9}=.349\ldots. \quad \text{(LXV)}$$

The volume v of the smaller portion of a partly filled barrel, that is, of the contents if the barrel is less than half full and of the empty portion if it is more than half full, is

$$v=.000472h(d^2+a^2+4b^2), \quad \text{(LXVI)}$$

where h is the distance of the surface of the contents from the nearest end, a is the diameter at the surface of the contents, and b is the diameter half-way between the surface and the nearest end.

WILLIAM FINDLAY.

MENTAL DEFECTIVES. See CHILDREN, DEFECTIVE; EDUCATION OF FEEBLE-MINDED OR MENTAL DEFECTIVES.

MENTAL DISEASES. These are diseases which show themselves in alteration of conduct or behavior. They are faulty adjustments within the individual which, due to faulty mental functioning, interfere with social values mutually agreed upon by particular groups, large or small. Such faulty mental functioning may be brought about by a vast variety of causes and be contributed to by a variety of defects or disturbances in many parts of the body. Mental disease may come and go, just as any other type of disease, and mental disease may be due, most frequently is due, to disorders primarily located in other parts of the body than the brain, although a mental disease means that the guiding function of the body as a whole, i.e., the mental functioning, is disturbed by faulty brain functioning.

A mental disease, therefore, only means that the adjustment of the individual as a whole,— the personality,— to his social environment is sufficiently disturbed to interfere with the well-being of that personality. It is primarily because such faulty adjustment tends to exclude the sick individual from his fellow-men,— the group or socius,— that mental disease is so much feared by the individual and is looked upon with dread and superstitious awe by the folk in general. In general it may be said that there are two aspects or trends of behavior exhibited by the individual in his reactions to his environment, conscious and the unconscious, and so there are two attitudes to be reckoned with in problems of mental disorders. If a man's tongue is cut out he cannot speak, and there are times when he apparently cannot speak, even though he has a whole tongue. Maybe his muscles are paralyzed. That may be

due to some change either in the nerve pathways leading to or from the brain which permit speech, or in the part of the brain to which these nerve pathways lead or in some other part. An attempt has been made to locate the part of the nervous system affected by means of the behavior of the man who cannot speak, both his actions in the use of his voice and his other actions. For, because of the close interrelation of all parts of the human being, certain types and groups of behavior will generally be found connected, as for instance if a man's inability to speak is due to some affection of the nerves between tongue and brain, there will be certain other physical symptoms, but if it is due to an improperly functioning centre in the brain, some other anatomically more distant activity will be affected. Thus a morbid area at the periphery might affect only one nerve, but if nearer to the centre it might affect two or more nerves, while directly at the centre it might affect all the nerves emanating from that centre and the activies regulated by them.

Human behavior is not merely physical, but is also mental, while the means we have of perceiving that behavior are exclusively physical. That is, the expression of some other person's mind can be reported to me only through the physical actions of other person as perceived by me. From this it appears that the diseases known as mental may be the *beginning* of a process which starts in purely mental conditions or the *end* of one which starts in purely somatic conditions. Physical traumata may indeed be the result of a lack of co-ordination due to defects of nerve function which in turn may be due to a mental conflict. Adler has brought out the fact that a very unfortunate series of physical injuries to the eye of one patient were the result of a maladaptation in co-ordination of such a nature that the reflex actions that generally operate to protect the eye did not work in this case. From this he deduces his theory of *organ inferiority*, an interesting corollary to some of the theories of the analytic psychology. For if the nervous constitution of this patient did not permit the usual reactions he would not necessarily be awkward because of an unconscious wish, as is the supposition of the majority of psychoanalysts. If a mental disease is an end product of a chain of bodily causes, which have been acting for some time, it is most likely that some or all of them will have manifested themselves before the time of the manifestation of the mental disease, and that the presence of these somatic symptoms will be associated with the mental disease and regarded as its causes. But if, on the other hand, the mental disease is itself the beginning and not the end of the process, it will require much more subtle tests to discover it, particularly in its earlier stages. It will be, too, of the utmost importance to detect, as early as possible, these beginnings which are manifested both in mental and in physical behavior, in order that remedial or preventive measures may be adopted at the earliest possible moment. In mental as in diseases of other bodily functions it is the preventive measures that are the most productive of good results. The greatest strides in making a decrease in mental diseases, as well as in those disorders thought of as bodily not greatly affecting the mental functions, come from taking the disorder in hand as soon as possible. Thus it would be most desirable to have teachers in all schools equipped with a means of detecting very early those early signs of later mental disorders which, although at present extremely elusive, are yet gradually, day by day, becoming clearer through analysis. Those in charge of the young should be the first to observe signs of a possible subsequent mental weakness, even in children apparently normal, and should be in a position to advise parents and guardians how to offset the deleterious factors in the child's environment. It is furthermore increasingly clear in what manner the overloading of the nervous system can produce not only mental disease, but, through the effect of the conflict between psychical requirements and physical constitution (an effect which is believed to take place in the nerve cells themselves), this overloading of the nervous system produces disorders in the physiological processes, and may therefore in the end produce what has been called an organic disease, namely, an alteration in the mode of working of one or more organs of the body, a condition which sooner or later undermines the general health.

It is noteworthy that a classification of mental diseases based on their relation to physical factors is not satisfactory, for the reason that the disturbances in mentality are not always found associated with lesion or degeneration of any or all parts of the brain and nervous system. In other words, a brain and nervous system which to all tests now applicable proves perfect in every respect may be found in the case of a person whose reactions to environment have been so unsatisfactory in adaptability that he has not been able to act his part in society, which has had either to support him as an otherwise harmless dependent or confine him as a destructive element. From this point of view the modern attitude toward mental disease is that it is a regression, whether from physical or psychical causes, to the condition of a more infantile or a more archaic type of mentality. It is recognized that the actions of the child resemble those of an earlier grade of human society, such as was the maximum of development in prehistoric ages; furthermore, that the responses of the modern individual to an environment which is daily becoming more and more complex are demanding of the individual a much more delicate adjustment and adaptation. Whether the failure to adapt is caused solely by a physical lack in the make-up of the cerebral and neural constitution is beyond the present power of physiology and histology to determine. It is therefore quite as useful to classify mental diseases purely from the mental standard, providing, however, the already ascertained connections between certain types of reaction and the discoverable lesions in the neural substance be not ignored. Therefore the present tendency in neurology is to make an analysis upon a purely psychical basis, namely, the mental mechanisms (q.v.) which have been observed to obtain both in the unconscious and in conscious life. It is now known that a phobia, or sudden unreasonable and excessive fear of some definite thing such as snakes, thunderstorms, knives, dogs, horses or what not, is neither to be explained on any conscious basis nor to be re-

moved by an appeal to reason or to consciousness alone. Similarly the habits of mind named obsessions or compulsions are amenable neither to drugs nor to the conscious adjurations to forget them or avoid them, but only to the education of the character through the freeing of the fixated libido.

Classification.—Almost every alienist of repute has attempted a classification of the forms of insanity. The subject is one of peculiar difficulty, owing largely to the fact that our intimate knowledge of many of these various forms is far from complete.

A scheme of classification adopted by Jelliffe and White regards the diseases of the nervous system as falling into three general classes: (1) Those of the physico-chemical systems, affecting the neurology of metabolism, and expressed in visceral neuropathology and diseases of the glands with internal secretions; (2) those of the sensory-motor systems, including affections of the cranial nerves, the peripheral neurons, the spinal cord, medulla, cerebrum and cerebellum and the meninges, with syphilis of the nervous system, and (3) those of the psychical or symbolic systems (neuroses, psychoneuroses and psychoses). The last contains the manic-depressive group, the paranoia group, epilepsy, dementia precox, exhaustion and toxic psychoses and those associated with organic diseases, with senility, arteriosclerosis, and finally idiocy, imbecility and feeble-mindedness.

A more detailed elaboration of this appears as the 1918 classification of the American Medico-Psychological Association. The methods of examination of the nervous system include a questionnaire covering the family history of the patient and his illnesses, and an elaborate physical examination of the vegetative nervous system, of the sensory and motor systems, followed by a thorough mental examination which in many respects is somewhat similar to the questions of the "intelligence tests" and qualification tests of the army. The alienist comes in contact with a great many diseases whose mental element is very small, no greater in fact than that of the so-called physical diseases. The disorders in the physico-chemical systems produce diseases with mental aspects, but aspects no more mental than those of the diseases affecting the organs, muscles, glands, etc., to which those nerves go. It is only when we come to what are called the neuroses that we find mental behavior alone or predominantly disordered. These affections were called neuroses or "nerve troubles" on the supposition once accepted that the mental behavior was caused exclusively by some peculiarity, whether called abnormality or merely variation, in the structure of the nerve cells themselves. At the present time, however, scientific thought tends toward the theory that mental disease is determined by the loss of balance between the organism and its physical and psychical environment. Thus there are nervous systems congenitally so weak that they are practically disintegrated by the conflict of the individual and society, a conflict which is, as often as not, absolutely unconscious, and which occurs in the simplest and least complicated social environment. In such natures mental disease at once appears because of the individual's inability to adapt himself to the rudimentary requirements imposed upon him from without. On the other hand, there are neural constitutions so strong or elastic that they are equal to a very severe strain of adaptation even to extraordinarily complicated environment. Such constitutions will naturally adapt themselves, retaining their own personal equilibrium and health, to conditions which would completely upset a weaker (that is, less adaptable) constitution. It may be here noted that the European War brought out many such diversities of neural constitution in those subject to "shell shock" or other war psychoses, together with improved methods of testing for congenital neural weakness. These tests have resulted in putting in positions of less nervous strain those who are unable to stand the greater. A similar allotment of individuals to the various tasks of life would naturally result in less nervous disease. For it is evident, when both factors are taken into consideration, the constitutional factor and that supplied by the environment, that mental disease is largely a matter of proportion between the nervous system and the load which is placed upon it. For example, a person who is not obliged to struggle for existence may never develop a mental disease which he would have developed, had he been subjected to the stress of adverse circumstances, while, on the other hand, his affluence may make him introversional, and, after the age of puberty, cause him rapidly to run counter to the demands of a true social existence.

The rôle of the unconscious in the etiology of mental diseases is a dominant one, and the comparative indefiniteness of the delimitations of the various types of mental disorders is due to the newness of any scientific knowledge concerning the unconscious portion of mental functioning. The neurologist should have, though unfortunately comparatively few do, as thorough a knowledge of the unconscious mental mechanisms as can be acquired, in addition to the medical specialist's knowledge of anatomy, physiology and histology. Recognition of the unconscious as a factor in the causes of mental disease requires the understanding that the present day unconscious is the direct descendant of the prehistoric consciousness. It is as if the human psyche were like the earth's surface constructed in strata, the lowest of which was the earliest deposited; much, too, as if the conscious life of successive generations from the earliest human and animal life were retained in the psyche of the present day as are the annual rings of growth in the stems of trees. The part played by the conscious or unconscious mental factor in the vegetative or visceral physiology is less evident to the general student than that played by them in the sensori-motor systems or in the psychical or symbolic systems. Yet there are good reasons to suppose that even so serious a disease as pulmonary tuberculosis may be helped, if not cured, by the patient's being taught how to secure control of the unconscious portion of his ego. The exciting causes for this disease, as well as of hysterical coughing and asthmatic attacks, may lie either in the physico-chemical, the sensori-motor or the psychical level. The connection between the diseases of the glands of internal secretion, the thyroid, parathyroid, hypophysis, pineal gland, etc., and the manifest mental condition is shown in the case of cretinism and of

exophthalmic goitre. In these diseases it is quite as likely that the cause is mental as that it is physical, and in such event, we should have to regard exophthalmic goitre as a symptom of a mental disease rather than the mental factors accompanying it as symptoms of the physical disease. Similarly the very widespread disorder, migraine, is possibly to be regarded as the projection upon a vegetative system, the vaso-motor, of a conflict which originates in the psychical level. Conflicts at the psychical level, which are usually caused by the lack of adaptation to social environment referred to above, may be projected upon the sensori-motor systems and produce retinitis, progressive facial hemiatrophy, various facial palsies, vertigoes, auditory and visual aphasia, tic douloureux, sciatica, shingles and peripheral palsies, and other diseases, many of which were considered up to recent times to have only physical causes.*

But the conflict, conscious or unconscious, which occurs at the psychical or symbolic level of the ego is manifested in predominantly mental modes in the so-called neuroses, psychoneuroses and psychoses. Of the psychoneuroses the commonest are *hysteria, compulsion neurosis* and *anxiety hysteria.* Of the actual neuroses there are *anxiety neurosis* and *neurasthenia,* while special cases present mixtures of these neuroses. As a mental disease, and not as popularly used to denote an uncontrolled emotional state, *hysteria* is now regarded as a partial dissociation of the personality, in which certain mental elements, namely, emotions and ideas, have been rejected from consciousness into the unconscious where they have an existence which is at least partly independent — an existence which is of vital importance to the welfare of the individual because it is an existence in which the split-off ideas and emotions have a growth or development of their own. This development is different in hysteria and in compulsion neurosis. In hysteria the mental elements, which are repressed from consciousness into the unconscious, direct or control a portion of the libido in such a way that its force has an incidence not upon the world of external reality, as is the case with the average person, but in the shape of work done in some shape or other. On the contrary the incidence of the libido falls upon the physiological functions themselves or upon certain of them through a variety of symbolic selection. This process, which is known as hysterical *conversion,* produces very many so-called symptoms, mostly of a bodily nature. There results from this a large number of disorders which the general practitioner is prone to regard as having only a physical cause, and he prescribes drugs, which rarely have the desired effect. Possibly the commonest form of this is the hysterical headache, which is rarely recognized of psychogenic origin, although it is so completely analogous to the "nine o'clock illness" of school children, who use this gentle form of unconscious malingering as a means for escaping their responsibilities. "An adult ought to make a call upon a recently bereaved friend." This is recognized as a distinct obligation but the patient's infantile necessity of escaping reality and seeking pleasure makes the duty seem a very onerous affair. Thus arises a conflict between duty, born of conscious appreciation of the social obligation, and desire, born of the childish inability to make the necessary sacrifice of personal comfort. As a result the patient develops a headache and so, being ill, does not have to go. While the mechanism in other hysteric conversions is more complicated, it is no less clearly proved, so that the number of what are ordinarily taken as symptoms having a merely somatic cause, and which are through analysis seen to be merely hysterical conversions, is augmented daily. Disturbances of sensibility, such as hemianæsthesia or insensibility to touch and pain on one side of the body only, disturbances of motility such as choreiform movements, tics and certain occupation spasms, disturbances of speech, sometimes including stuttering, visceral disturbances showing vomiting and diarrhœa, vaso-motor disturbances and emotional disturbances, particularly in cases of great exaltation or depression, are all likely to be caused by the hysterical dissociation before mentioned, in which some mental factor is repressed and therefore driven without the pale of conscious control.

In *compulsion neurosis* there is no conversion, which implies a shifting of the incidence of the libido power from the external world, which is its natural goal, to the physiological processes of the individual; but there is another kind of shift, namely, from the external world to the mental states themselves. In this condition the numerous physical symptoms mentioned as being found in hysteria are generally absent, but their place is taken by variation from the conventional modes of thinking. Such variations to be sure are far from unpleasant, if they do not become too great, for they add much of piquancy and interest to a person's character. But when the departure from the conventional is excessive and both compulsive and unaccountable, the condition merits the term neurosis and requires treatment from the analyst. There are compulsive thoughts, compulsive doubts, fears, acts, rituals of dressing and undressing or eating for which this kind of neurotic can give no reason. He generally does not attempt to rationalize them but admits he does not know why he always has to act or think in his own peculiar way. Analysis has convinced Freud that "obsessions are always transformed *reproaches,* returning from repression, which always refer to a pleasurably accomplished sexual action of childhood" and that "the compulsive ways of thinking and acting are only substitutes for the reproaches which are symbolical distortions formed in order to prevent a recognition on the part of the patient of the real meaning, so as to keep from his consciousness a realization of the circumstances of his guilty conduct."

Paranoia is a group of mental diseases containing the paranoia as defined by Kraepelin, and various mixed aberrant forms, some of which are called paraphrenias. In general it is a disease in which there are delusions of persecution that have been pretty well systematized. The disease progresses usually through four rather well-defined stages. In the first the patient is unduly concerned about his health,

*Hawthorne had an inkling of this when, in his 'Scarlet Letter', he wrote: "physical disease, which looks like a thing in itself, and separate, may be only a symptom of a disturbance in the spiritual (mental) part of our being."

and particularly about what goes on around him in relation to himself. That is, he considers more things are said and done with reference to himself than does the ordinary person, and he begins to reason it all out that there must be some agreement in the actions of persons or things around him, usually for his discomfiture or ruin. Hallucinations of hearing are common. The result of his thinking himself to be the victim of persecution is that he sometimes becomes very dangerous, and attacks the persons whom he regards as his persecutors. In advanced cases the system of ideas worked out in justification of the suspicions of persecution or conspiracy is very elaborate, and includes frequently falsifications of early memories, which contribute the grain of truth in some of the projected reproaches. Another classification of the paranoia group of mental diseases is that into two divisions, the *original* and the *acquired*, the first being the inevitable development of a character which was of such a constitution as to develop into exactly this form of mental disease, in spite of an environment even partly favorable to a wholesome life, and the second, the effect of an untoward environment upon a neural constitution which might in more favorable circumstances have escaped this fate. According as hallucinations are or are not present, these groups are further divided respectively into *paranoia hallucinatoria* and *paranoia combinatoria*. Furthermore the individual cases are described as persecutory, expansive, querulous, litigious, inventive, reformatory, religious and erotic, according to the forms which the more prominent mental symptoms show. A third division of the paranoia group is into delirium of interpretation and delirium of revindication. In the first the erratic element is in the interpretation of the factors of the environment of the patient, who remains otherwise quite clear minded, and in the second there is a tendency toward the formation of a fixed idea, either egocentric or altruistic. As paranoia was considered an incurable, progressive and chronic disease, those cases which through analysis have been shown to have at the basis of them an idea that could be traced out and corrected, and which therefore have been called acute paranoias, necessitated a further reconstruction of the concepts underlying the classification. The result of this is that the content of the mental states in this form of disease is not now considered so indicative as the mental mechanisms involved. This implies again that it is not so much the delusion, or the suspicion itself, or any other of the symptoms, which used to be considered characteristic of the disease, but it is the inability on the part of the patient to adapt his ego to those ideas which form the so-called content of the paranoid state. The delusion, for example, is found to have been made by the patient for the purpose of making a certain emotion tolerable which he could not get rid of. The removal of the delusion would not in such a case help, for another would have to be supplied in its place, to explain the original emotion, which would itself remain. The emotion or a lack of control over the emotions is thus seen to be the most fundamental cause of the disease. The explanation of paranoia consists, therefore, in the emotional lack of control, which fixes upon certain ideas and is unable to change them, and furthermore in an exaggeration of the mechanism of projection. (See MECHANISMS, MENTAL). Finally Sigmund Freud states that paranoia is dependent upon a homosexual fixation in the psychosexual development of the individual. Treatment of paranoia has been more earnest and determined of late, as more and more cases have been handled with greater success, but it is to be remembered that the curable cases are now by many regarded as only paranoid forms of other mental diseases, and that the true paranoiac is known as paranoiac virtually only by the failure of all efforts to improve him. Psychoanalysis is the only means by which any satisfactory knowledge can be gained of the unconscious mechanisms dominating any given case, and only by a thorough study can it positively be determined how much or how little can be accomplished in the way of therapeusis.

Epilepsy and various convulsive types of reaction including the classical epilepsy, some attenuated forms such as affect epilepsies, and those of gross brain disease, constitute a class of mental disease in which there is well-known physiological and anatomical change in the brain itself. The disease is apparently hereditary, in the sense that in the history of all epileptics there is usually to be found some taint in the family or in collateral branches. The epileptic convulsion of the classical type is a spasm with unconsciousness, preceded by a warning called the aura, and followed by a gradual wakening or a deep sleep. The variations are exceedingly numerous. Modern investigation has shown that there is some association between the epileptic fit and the gratification of an unconscious wish. Epileptics are likely to be of a low order of intelligence and their reactions to be analogous to those of children or infants. Some cases indeed do turn out later to be imbeciles. Treatment is not generally considered to be of avail, except possibly in psychogenic cases, where analysis can sometimes straighten out the complexes of the patient. The best care is secured in the colony plan where training in healthful outdoor occupation is possible.

The *Dementia Precox* (Schizophrenia) group of mental diseases contains the so-called dementia simplex, hebephrenia, catatonia, some paranoid forms and certain mixed or atypical states. The mental symptoms of the dementia precox group include an emotional dullness, which is thought to be due to the fact that in this disease the patient shuts himself into his own thoughts and is therefore less moved by external occurrences than are ordinary persons. That is, his thoughts lose their reference to external reality and the result in the worst cases is that nothing in external reality can move or arouse the confirmed dementia precox patient. Another feature which is an outcome of this segregation from external interests is his so-called negativism, which is shown in his either refusing entirely to do what he is told or doing it as negatively as possible. Thus, if he is told to hold out his hand, he puts it behind his back; if told to stick out his tongue, he shuts his mouth tight. This segregation of the behavior from all relations with external reality (and in the last analysis reality amounts to little more than the relations of the indi-

vidual with other persons), is a splitting of the personality, which is the reason for the alternate name of dementia precox: schizophrenia or "split mind." The detailed features of this separation of the behavior from all that in the average man is in close connection with his behavior are as numerous as all the possible types of relation of the individual with his environment. Some of these are suggestibility, failure of voluntary attention, disturbance of orientation, disorders of memory. The delusions have been shown in many cases to be symbolisms of the conflict going on in the unconscious. The fact that the conflict is unconscious accounts for the difficulty of getting at it and of re-establishing satisfactory relations with the patient. Other symptoms are physical such as the mannerisms, stereotyped modes of action, unusual words or expressions so frequent in dementia precox, and the rigidity and stupor which characterize some of the patients.

Whatever reactions to the environment remain in the patient are marked by an archaic or primeval character, such that in the evolution of human behavior the highest, most complicated and latest acquired types are those first to be lost. In the disease the individual reverts or regresses to a form of behavior which may possibly be supposed to have been valid and current in prehistoric ages. As behavior may be regarded as built outward from a central core, this form of psychosis is what is known as an introversional one, that is, one in which the libido introverts or regresses to a more fundamental and therefore more archaic form of gratification. There are other physical concomitants sometimes noticed, such as an unusually small heart or a tendency to pulmonary tuberculosis. The onset of the disease is either gradual or sudden. If gradual it may be mistaken at the beginning for other types of mental disease, such as the manic-depressive, hysteria, compulsion neurosis, etc. It is in this disease more difficult than in most others to make any satisfactory statement as to whether it has a physical or a mental origin. As the bodily changes so far discovered have been so few and their bearing so uncertain, it is more advantageous at the present time to explain the disorder on a purely psychological basis. The patient is faced with a situation in which the balance between environment and congenital ability to adapt to it is inevitably lost, whether because of the disproportionate burden placed upon him by his environment or because of his innate weakness rendering him unable to support the average load. In this connection it is to be remembered that many ordinary persons declare their burden is too heavy for them to bear, and that few ever know their extreme abilities; consequently the loss of balance may have a purely psychical cause lying within the unconscious desire of the particular person. When a person says that something will drive him crazy, he is unwittingly expressing an unconscious desire, not to become ill mentally, but to receive the care and symbolic homage which is given to the mentally ill. The severity of the mental symptoms may be regarded as a measure of how far the unfavorableness of the environment has driven back the individual patient from reality. There are cases of moderate confusion which appear in almost all respects perfectly natural persons, and only later develop a disorder great enough to dissociate them from their fellows; while in the so-called catatonic cases the inability is generally complete. The cases which have subsequently become well have gradually made an adjustment to reality in some form, either indirectly through the formation of delusions, or directly by a final domination of the reality motive. Cases that do not get well tend to sink to lower levels till they reach one on which they can succeed in maintaining themselves with comparative steadiness. This is notably the case in institutions, while in the world of life such persons join the ranks of tramps, prostitutes and petty criminals, thus finding their appropriate level.

The treatment of the physical condition is always according to the nature of the bodily symptoms, and the treatment of the mental condition must take into consideration the involvement of the higher or psychological levels of the personality and give as much analysis as possible, in order to reconstruct the social relations if that can in any way be done. Prevention of this disease is one of the most important ends that could be achieved by civilization, and is primarily attained through eugenic methods, lacking which the only means at present known lie in the correction of all irregularities of character as early as they may be observed in childhood and an absolutely frank and scientific handling of the question of sex, the source of much that is anomalous in human character.

A division of infection and exhaustion psychoses comprises those resultant upon fever, exhaustion or collapse and upon typhoid fever. While all these diseases have mental aspects, the treatment of them is so essentially in accordance with the disease of which they are themselves virtually only the symptoms that they need not be described here in detail. There is a special form of mental reaction following the over-indulgence in alcohol, in opium, cocaine, bromides, carbon monoxide, lead, mercury or from uremia, diabetes mellius, pellagra and certain gastro-intestinal diseases. In none of the mental diseases is the matter of individual psychology more important than in alcoholism, as the reasons for drinking which are assigned by people in general are merely rationalizations. (See MECHANISMS, MENTAL). The real cause why people drink to an extent which harms them is that their neural constitution craves the gratification which they get from this source alone. The very fact that a man or woman cannot stop drinking therefore stamps them at once as having a weakness in their nervous constitution. The alcoholic takes his peculiar way in creating an artificial balance, so to speak, in order to make up for the loss of balance between his neural constitution and the demands made upon it by his environment. It is his way of taking the cash and letting the credit go. Alcohol is the quickest path for some persons to shut out the world of reality, which has been found too arduous, and to open up the world of fantasy, the fact that the individual is unable to face reality being the really important point. Accordingly it is not surprising to find that ordinarily the alcoholic is in other respects, aside from his alcoholism, an example of general inefficiency. His unconscious appreciation of his essential inferiority is partly what leads him to flee from the world

of reality to the world of intoxication fantasy. That alcoholism is an indication of a deep physiological weakness, too, is to be inferred from the high mortality in pneumonia and other diseases among alcoholics.

The same remarks could be made about the mental aspects of over-indulgence in opium, morphine, cocaine and other poisonings. The amount that any given individual can stand depends, as is well known, on the individual's constitution. The more he can stand, the stronger the constitution; but from another point of view, the greater need he has for some drug to change, through its effect upon himself, the nature of his relations with the external world, the weaker he is as a mechanism and the less suited he is for the field of activity in which he finds himself. In all of these drug indulgences the treatment of the patient by means of other drugs is merely palliative and does not go to the root of the matter. The only hope of doing this is through psychoanalysis, after the acute disturbance has ceased. There are psychoses, too, associated with organic diseases such as apoplexy, chorea, paralysis, multiple sclerosis, polyneuritis and heart disease; also with presenile, senile and arteriosclerotic conditions.

Finally feeble-mindedness, idiocy, imbecility, regarded as defects in personal endowment or development, have the mental aspect that they cannot live in society acceptably to the degree of being either self-supporting, or of supporting anyone else. The economic importance of these defective classes is being recognized and the more as psychological methods have been devised for grading all individuals into the classes which show characteristic differences parallel with the differences between children of ages between 1 and 14 years of age. Very extensive researches by Binet, Simon, Goddard and Terman have shown that the general intelligence grows steadily up to age 14, while above that age there are roughly three groups, the low, average and high adult intelligence. What is meant by feeble-mindedness, imbecility and idiocy can be given a very exact form in a table like the following:

Mental age	Capabilities	Class
Under 1 year.	Helpless	Low class idiot
1 year	Feeds self. Eats everything	Middle class idiot
2 years	Eats discriminatingly	High class idiot
3 years	No work. Plays little	Low class imbecile
4 years	Tries to help	Low class imbecile
5 years	Only simplest tasks	Middle class imbecile
6 years	Tasks of short duration. Washes dishes	Middle class imbecile.
7 years	Little errands in house. Dusts	High class imbecile
8 years	Errands, light work; makes beds	Low class moron
9 years	Heavier work. Scrubs, mends, lays bricks, cares for room	Low class moron
10 years	Good institution helpers. Routine work	Middle class moron
11 years	Fairly complicated work with only occasional oversight	Middle class moron
12 years	Uses machinery. Cares for animals. No supervision. Cannot plan	High class moron

The advantages of these so-called intelligence tests, so clearly shown in the organization of the national army, are of further advantage in finding out whether a mental defect is inherited or acquired, because in the inherited mental defects a termination of the individual's ability to go through the tests is quite even. He can do all of the tests of ages one to seven, for example, but cannot do any of those above that age. On the other hand the case is not so clean cut with acquired defects, the individual being able to do some but not all of those tests several years above his mental age and not all of them below it.

In conclusion it should be emphasized that the mind and the body are one unity and whatever affects the one is not without effect upon the other, that it is almost if not quite impossible to draw the line between mental and bodily disorders, and that the ultimate truth will be found in the statement that mind is but the function of body and body but the perceptible expression of mind. Therefore few diseases can be regarded as exclusively mental and but few as exclusively physical. Consult Jelliffe and White, 'Diseases of the Nervous System' (3d ed., 1919); and White and Jelliffe, 'Modern Treatment of Nervous and Mental Disease' (Vol. II, 1915).

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MENTAL HYGIENE. Hygiene has usually been conceived of as a system of measures for the creation of conditions *without* for the maintenance of the *bodily health*. Mental hygiene is an effort to create favorable conditions *within* which will make for *mental health*. Whereas hygiene heretofore has dealt with external conditions which are favorable to health, such as fresh air, sunshine, pure food, exercise, etc., mental hygiene deals with the principles of right living as they apply to the regulation of our thoughts, our feelings, our activities. In its practical applications mental hygiene attempts to deal with the problem presented by the tremendous demands of our fundamental instincts for adequate expression. It sees in human failures inability to adequately harness these instincts, while in success it sees them adequately expressed in activities that are at once creative and socially acceptable and valuable. The principles of mental hygiene receive their formulation as a result of an understanding of the development of the human mind from earliest infancy to adulthood expressed in terms of a constant interplay and compromise between instinctive desires and social repressions. These principles will receive their application along two main lines of endeavor. One by applying them to the scheme of education, modifying it and minimizing the severity of these conflicts, and secondly, in individual instances by an examination of the particular situations under which difficulties have produced disturbing symptoms in the individual.

As soon as the difficulties of the individual are seen as evidences of his endeavor to make his particular instinct-constellation fit in with the social requirements, it is seen that a vast amount of convention, particularly the criminal law, is the reaction of society against instinctive manifestions by an effort at forcible repression, and just as education would not be complete if it stopped wholly at efforts of repression just so mental hygiene points out that society's methods of dealing with its delinquents are not complete when measures of repression, censure and condemnation alone are used. As

in dealing with the child it is necessary to search for and help to develop all the positive characters of value, so in dealing with the delinquent it should be society's effort to search for and develop to their fullest extent all those strivings for better things which no one is without.

This new point of view is applicable to every relation which involves the individual and society, and its ideal must be to bring about a state of understanding rather than a blind clashing of instincts between these two. When this is done individual instinctive indulgence, instead of being met by blind social condemnation, will be met by an intelligent vision which sees the indulgence as a relatively infantile, undeveloped type of reaction and which sets about to bring to pass a different reaction formula by methods of repression where necessary and to the extent necessary carefully checked by adequate controls but which does not neglect those educational procedures without which no repression is safe.

The practical application of the principles of mental hygiene must come about as a result of a more complete understanding of the developmental stages of the human individual and this means specifically a more complete understanding of the development of the child. This is the "century of the child" and in many ways the advances that have been made in child study point the way toward an adequate hygiene of mind. This is so because in all of the defective and delinquent conditions, as we find them either in children or adults, we see evidences of defective psychological development either gross or in detail. In other words, the adult delinquent, or the mentally ill adult, presents distinct evidences of having been arrested at some point in his psychological development, so that in that portion of his behavior which is circumscribed by this limitation there are the outward appearances of infantilism or childishness. The moods, the grouches, the irritabilities, the petty dishonesties, lying and pilfering, the subtle cruelties and deceptions, selfishness, over-conscientiousness, prudery, emotionalism and a thousand other traits of character are all the better understood when they are seen to be childish types of reaction, and are almost immediately appreciated as such as soon as the analogy is suggested.

The immediate problem of mental hygiene as addressed to such character traits as have been enumerated above is to approach their study in the individual case with a view to unfolding the causative factors which have, within these certain areas of conduct, prevented the individual from progressing along the usual lines of development and having succeeded in this endeavor, helping the individual to find avenues of expression for this pent-up energy in more useful ways.

All these results have been made possible by a study of the development of the child and realization for the first time that the child is not simply a small adult, but has standards of conduct, points of view, attitudes of mind which it is extremely difficult, if not impossible, for the adult to feel himself into. An appreciation of these facts, together with an attitude toward the individual which is truly constructive, the parental attitude in the best sense, is what is needed. So that in the treatment of these sick individuals there is arising in society an attitude which is a development of the parental instinct as a result of better understanding.

The defects in the parental instinct have been that children have been considered the property of the parents, existing only for their use and satisfaction. This has been the history of the child throughout the ages. Now it must be appreciated that a greater sacrifice is demanded of the parent if the child is to grow up to successful adulthood. Only the interests of the child should be considered by the parent, and not the parent's personal desires. On the other hand the child should be weaned from considering that the parents belong to it and exist for its pleasure, otherwise a dependent attitude upon the love of the parents will persist into adult life. The basic necessity, therefore, for the healthy adult is a healthy relationship between parent and child which results finally in a normal, healthy emancipation of the latter, resulting in the greatest possible attainment of individual efficiency.

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MENTAL PROCESS. A term used in psychology to denote the phenomena of mind viewed as changing rather than as timeless substances. One of the great changes which has come over philosophy in the past century or so is the obsolescence of the notion of substance. It is realized more and more that the unity of phenomena is to be explained, not by the fixity and homogeneity of a stuff behind them (see PANPSYCHISM), but as the persistence of a certain type of change or process. Just as the physicist has ceased to worry much about the nature of matter or the ether and has given himself wholeheartedly over to the study of their laws of change, the psychologist has come to see the utter barrenness of the substantial conception of mind, and now interprets the mind and all phenomena pertaining to it under the category of process. The mind itself is often treated as the stream of its states, while these are no longer regarded as instantaneous, but rather as undergoing a temporal waxing and waning of their own. Consult James, W., 'Principles of Psychology' (New York 1890); Stout, G. F., 'Analytic Psychology' (London 1896); Titchener, G. B., 'Textbook of Psychology' (New York 1910); Wundt, W., 'Grundzüge der physiologischen Psychologie' (6th ed., Leipzig 1908–11).

MENTAL SCIENCE, the science of mind: (a) properly, a synonymous term for psychology, or that branch of metaphysics which treats of the aggregate of knowledge concerning the mind and mental operations. (See PSYCHOLOGY; INDIVIDUAL PSYCHOLOGY; SOCIAL PSYCHOLOGY; and related references). (b) A term also applied to various empirical systems of religious and philosophical thought, which propound the doctrine that most physical ailments are curable by faith, or rational exertion of the mind, without the aid of medicine. See CHRISTIAN SCIENCE; EMMANUAL MOVEMENT; FAITH; NEW THOUGHT; SOUL.

MENTAL TESTS. In the early eighties the experimental method was developed in the

study of mental life through the establishment of various psychological laboratories. Certain aspects of this work, though not originally aimed at any practical application, did attract the attention of those interested in abnormal minds, the psychiatrists, and to a lesser extent the attention of those interested in controlling the development of minds, the educators. Gradually there came to be developed in this way methods of investigation somewhat more direct and somewhat simpler than the typical laboratory experiment — methods aimed at probing or measuring mental capacities for diagnostic purposes — and these methods became known as "mental tests."

The things tested were at first mainly sensory vacuity and sensory discrimination, like keenness of vision and ability to notice small differences of pitch; motor ability, like speed of tapping, accuracy of aiming and steadiness; memory in its varied aspects, like memory for nonsense syllables, recognition of forms and colors and capacity to commit to memory; imagination, both passive and active; and especially quickness of association, that is, the speed with which a person, on being given a word, can respond to it with another word related to the first in some prescribed manner. There were also many attempts at measuring capacity to attend, as by the various "cancellation" tests in which the examinee had to cross out, or cancel, designated materials, e.g., every *a* in a page of print; and again by tests in which words, pictures, diagrams, etc., were exposed to view for a very brief time by specially devised instruments. Much was expected, too, from the development in the laboratory of very elaborate apparatus and technique for measuring reaction time, i.e., the speed with which a person could respond by a designated movement to a given signal, e.g., by pressing a telegraph key on seeing a flash of red light — a type of work evidently closely connected with that just mentioned in the measurement of speed of association.

Now, with a few exceptions, these attempts to develop a series of mental tests from the experimental methods of the laboratory psychologist have been worth while, but the progress thus made in measuring special aspects of mental life has been entirely overshadowed in the mind of the lay public by developments in another direction — namely, in the determination by mental tests of levels of general intelligence.

About 1905 the French psychologist, Alfred Binet, reported the result of an attempt made by him in conjunction with a physician, Dr. Simon, to devise a system of tests that would serve to select children of subnormal mentality for segregation for special instruction in special classes. In 1908 and again in 1911 the same authors published improved editions of what is now generally referred to as the "Binet-Simon Scale for Intelligence Testing," or, more briefly, as the "Binet Tests."

The root idea of the Binet scale is to assemble a considerable number of relatively simple short tasks of varied character and to classify these into groups which correspond with the average or "normal" performance of children of a given age. Each "age" is represented by five or six tests. Thus, in the recent "Stanford Revision" of the Binet tests, prepared by Dr. L. M. Terman of Stanford University, an eight-year-old child is given these tasks: counting backwards from 20 to 1; drawing a simple plan for finding a ball lost in a field; answering certain simple inquiries like "What should you do if a playmate should hit you accidentally?"; stating the similarities between things like wood and coal; defining words like balloon, tiger; knowing the meaning of at least 20 of a set of prepared terms.

Others of these mental tasks, to name a few at random, are the counting of pennies, the naming of colors, memory for digits, the interpretation of fables, the detection of absurdities in statements, etc.

In addition to the Terman arrangement American examiners are wont to use editions of the Binet tests prepared by Dr. Goddard, formerly of the Vineland Training School, by Dr. Kuhlmann, of Faribault, Minn., by the late Dr. Huey, formerly of Johns Hopkins University, or by Dr. Wallin of the Saint Louis public schools. Whatever be the precise form employed, the Binet tests yield results, known as the "mental age." If this coincides with the chronological age the child is said to be "normal" or "at age"; if the mental age be higher the child is "mentally advanced," "accelerated," "superior" or "gifted"; if the mental age be lower the child is "mentally retarded," "inferior," "dull" or "subnormal." It is customary to indicate the degree of deviation relatively, by multiplying the mental age by 100 and dividing by the chronological, or life age: then, as will be understood, the "intelligence quotient," or "I. Q.," is 100 or thereabouts for the average or so-called "normal" child, runs below 100 for those below average mentally and above 100 for those above average mentality. Roughly speaking, a child with an I. Q. below 80 may be termed mentally subnormal and above 120 may be termed gifted. About five children in 100 are as inferior and about five are as superior as indicated by I. Q.'s of 80 and 120 respectively.

The amount of activity stimulated by the work of Binet has been truly surprising. Bibliographies prepared by Dr. Kohs list 711 books and articles dealing with the Binet tests up to 1917. Practical application has been most common in the direction of Binet's original aim, i.e., in detecting subnormal mentality and in measuring its degree. Thus, special classes for backward or for subnormal or for actually feeble-minded children are now commonly recruited with the aid of these tests. Similarly in juvenile courts the tests have proved valuable in showing the presence of arrested mental development or low degrees of general intelligence in a large proportion of the delinquents brought to trial.

Among other developments from the original Binet scale should be mentioned the Yerkes-Bridges "Point Scale" in which many of the Binet tests are used, but a method of scoring by points is substituted for the Binet age-level principle.

The usefulness of the Binet method, great as it undeniably is, is purchased at the expense of certain limitations: finer differences in degree or type of intelligence are not well revealed; adults cannot be so successfully tested as children; it cannot be administered simultaneously to a group of persons.

The sporadic efforts of various psychologists to overcome these limitations, to develop a series of group tests to measure the general mental ability of adults, have been powerfully stimulated and co-ordinated by the advent of the war. As a result of preliminary trials in 1917 there has been developed and put into wholesale operation in the army cantonments a system of mental testing that virtually affords a "mental survey" of the distribution of intelligence in all the various groups of men composing a modern army. The system includes, beside the regular group tests, special tests for men who do not speak or write English well, and also various supplementary individual tests for the examination of men who fail to do well in the regular group tests.

It is clear already that the successful use of mental tests in the army, following the success obtained in educational and correctional institutions, will contribute much to the spread of the idea that a measurement of mental ability is as important and as feasible (even if not always as precise) as a measurement of physical ability. The idea that applicants for positions in commercial and industrial organizations — salesmen, clerks, skilled workers, executives — should demonstrate their mental ability by passing suitable mental tests is bound to make rapid headway; similarly, the idea that in our public schools the most efficient instruction demands the segregation of children into groups of approximately like native ability as well as of approximately like school attainments.

These rapid developments in the use of mental tests will mean the creation of a new profession — that of the consulting or the applied psychologist. We may expect that in the not distant future persons of varying degrees of expertness will proffer their services in applying mental tests to the solution of various educational, sociological, medical, industrial and commercial problems. It will become necessary for the sake of this new profession of "human engineering" to warn the public against the charlatans who are already trading on the name of "psychologist." In essence, the situation would appear to be this: the mere quasi-mechanical administering of well-known tests, like the Binet tests, may be entrusted to a person of comparatively meagre professional training; the interpretation of the results of tests demands a fair working knowledge of psychology, a good college training and perhaps a year of special drill in the handling of tests under direction; the devising of tests to meet special needs, the prescription of educational, sociological, penological and other treatment for the modification of human behavior demands not merely these qualifications but also a well-rounded and intensive knowledge of mental life and a systematic knowledge of psychology, in other words, demands the psychologist as well as the "mental tester." We may expect that eventually some sort of public if not legal recognition will be given to these different uses of mental tests and to the qualifications necessary for undertaking them.

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Author of 'Manual of Mental and Physical Tests.'

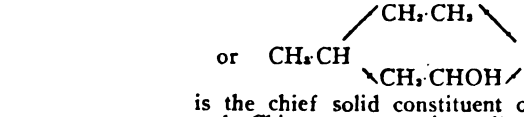
MENTCHIKOF, or MENSHIKOV, Alexander Danielovitch, Russian soldier and statesman: b. Moscow, 6 Nov. 1672; d. Berezov, Siberia, between November 1729 and February 1730. He was of obscure parentage, but succeeded in entering the service of Prince Lefort, the favorite of Peter the Great, later discovering and thwarting a conspiracy against his patron's life. After serving in the campaign of Azof, he accompanied the Tsar on his trip through Holland and England, and on the death of Lefort became his chief adviser. He was created field-marshal and prince by Peter, and prince of the German Empire by Leopold I, and during the absences of the Tsar acted as regent. During the campaign of 1706 he defeated the Swedes at Kalish, and in 1709 was largely instrumental in securing the victory over Charles XII at Pultowa. In 1710, as commander of the Russian forces in the north, he took Riga, occupied Pomerania and Holstein, and conquered Stettin. His arbitrary acts, however, finally resulted in his court-martial by Peter, though the death sentence was commuted to fine. He was one of the principal factors in the accession of Catharine I to the throne (1725–27), and till her death was all-powerful, and even after Peter II succeeded to the throne he had absolute control of the government. He was about to marry his daughter to the young Tsar when he was suddenly overthrown by Dolgoruki (September 1727) and banished to Siberia.

MENTHACEÆ, sometimes known as *Labiatæ,* a family of dicotyledonous herbs or shrubs distributed mainly in temperate climates. The species, of which there are more than 3,000 grouped in about 150 genera, are characterized by four-cornered stems; opposite, exstipulate leaves; mostly two-lipped flowers generally in whorls, cymes or heads; and one to four achenes in a persistent calyx. They are noted for their volatile oils, which in many instances are of economic importance either as perfumes or as flavorings. Some species are cultivated for ornament, but probably the best known are those which have been used for centuries for flavoring food, such as sage, thyme, savory, marjoram, mint, balm and basil (qq.v.). The kinds used most frequently in perfumery are probably lavender, rosemary and patchouli. One species, variously known as Chinese or Japanese artichoke, chorogi and knotroot, *Stachys sieboldi,* yields edible tubers which are eaten raw or cooked in Asia, France, and to a small extent in the United States. Many labiates have at some time been reputed medicinal but are now rarely used except to disguise

the taste of disagreeably flavored drugs. The best-known genera represented in the United States are *Nepeta* (catnip), *Mentha* (mint), *Origanum* (marjoram), *Salvia* (sage), *Thymus* (thyme), *Marrubium* (horehound), *Satureia* (savory), *Lavandula* (lavender), *Monarda* (horsemint), *Ocimum* (basil), *Melissa* (balm), *Scutellaria* (skullcap), *Lamium* (dead nettle), *Calamintha* (calaminth), *Teucrium* (germander), and *Trichostema* (blue curls).

MENTHENE. See METHANE.

MENTHOL, peppermint camphor, $C_{10}H_{19}OH$,



is the chief solid constituent of the Japanese and Chinese peppermint oil (from *Mentha piperita* Linne, or *Mentha Arvensis*). American and English oils contain menthol in much smaller quantities, and the menthol obtained from these sources is said to differ from Chinese or Japanese menthol in its crystalline structure.

The commercial product is chiefly obtained from the Japanese oil of peppermint, which sometimes contains from 70 to 90 per cent of menthol. For the extraction of menthol the oil is cooled to a very low temperature, when prismatic crystals separate out. The yield is considerably increased by subjecting the peppermint oil to fractional distillation and then cooling the residue. A number of substances are sometimes used to adulterate the commercial product; among these may be mentioned hydrated magnesium sulphate, paraffin, wax, thymol and various inorganic compounds. The pure substance should possess a sharp melting point and should completely volatilize when heated on a water-bath in an open vessel. Menthol separates in long prismatic crystals. It melts at 43° C., and boils at 212° C. The crystals possess a strong peppermint odor and a cooling taste. It dissolves readily in alcohol, ether, chloroform, carbon bisulphide, strong acetic acid and in a number of oils. Its solubility in water is very slight but the water solution possesses the odor and taste of the substance.

The molecule of menthol contains three asymmetric carbon atoms, and a number of stereo-isomerides are possible; the commercial product consists mainly of the laevo modification. Menthol exhibits the properties of a saturated secondary alcohol. Careful oxidation with chromium trioxide converts it into the corresponding ketone, menthone. With acids it yields esters. With phosphorus pentachloride it forms menthyl chloride. Heated with phosphoric anhydride or zinc chloride it forms menthene, $C_{10}H_{18}$. With copper sulphate it yields cymene, and with hydriodic acid, in the presence of phosphorus, it forms hexahydrocymene.

Menthol acts as a mild local anæsthetic. In the form of cones or in solution in various solvents it has been used as a remedy for neuralgic headache, toothache, catarrh of the nose, asthma, diphtheria, diarrhœa, sciatica and tuberculosis of the bone. Sometimes it is also employed as the chief ingredient in atomizers, inhalers, toothpastes, ointments, liniments, and in a number of preparations for internal use.

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MENTONE, mĕn-tō'nĕ (Fr. MENTON, mŏñ-tôñ), France, a seaport town and health resort on the Mediterranean, in the department of Alpes-Maritimes, near the Italian frontier, and 15 miles northeast of Nice. It is charmingly situated on a promontory about the middle of a bay five miles in circuit, encircled by abruptly rising hills. The ancient walls of the feudal town are still standing, and there the streets are dark and crooked. The new part of the town, with numerous fine villas, stretches along the base of the hill on which the old part is situated, parallel to the sea. The climate of Mentone is mild and equable; it is rare that the thermometer descends as low as the freezing point, or rises higher than 86° F., hence making Mentone a favorite resort for persons in delicate health. There is a considerable trade in fruit, in flowers and leaves used in the manufacture of perfumes, and in olive-oil. The town of Mentone belonged to the principality of Monaco from 1346 to 1860, but in the latter year was ceded to France. In the vicinity, but on Italian territory, are the grottoes of Baoussé Rousse, popularly known as the Caves of Mentone, famous for the valuable evidences of prehistoric man that they have yielded. Pop. (of commune) 18,000.

MENTOR, according to Greek legend, the faithful friend of Ulysses, who entrusted to him the care of his domestic affairs during his absence in the war against Troy. The education of the young Telemachus fell to his charge, and when the latter set out on his voyage in search of his father Minerva accompanied him under the form of Mentor (Odyssey, ii, 390; iii, 12, etc.), acting the part of a prudent and experienced counsellor to the young hero. This character of a sage adviser is more fully developed in the Télémaque of Fénelon, in which Mentor plays a conspicuous part.

MENZALEH, mĕn-zä'lĕ, or **MENZALA,** Egypt, a large lake or lagoon (one of several at the Nile delta), extending from Damietta to the Suez Canal, and running parallel with the Mediterranean, from which it is divided by a narrow slip of land, from 2 to 12 miles in breadth. Length of the lake from northwest to southeast, about 50 miles; average breadth, about 20 miles. It receives the Pelusiac and Tanitic branches of the Nile, and communicates with the sea by three openings called Dibeh, Gemileh and Om Farejeh. The lake is of comparatively recent origin, and covers what was a fruitful district of the delta, having formed through neglect of the dams. There is a small town of the same name on the south side of the lake. The Suez Canal cuts into its eastern edge from north to south.

MENZEL, mĕn'zĕl, **Adolf Friedrich Erdmann von,** German artist: b. Breslau, 8 Dec. 1815; d. Berlin, 9 Feb. 1905. In 1830 his parents settled in Berlin, where his father had a lithographic studio, and where the son studied a little in the academy and more by himself. At 18 he published a cycle of lithographs called 'An Artist's Wanderings,' which immediately attracted attention; four years later he had begun to draw historical scenes from the past of Brandenburg and had commenced painting in oils with 'Checker-Players' (1836) and 'Judgment' (1837). About the same time his work as an illustrator opened up with the 400 pictures

for Kugler's 'Frederick the Great' (1840), in which Menzel showed himself original, dramatic and historically correct. This vein he followed out in his 200 illustrations for the 'Works' of Frederick the Great, and in 600 more accompanying a work on the army of Frederick the Great (1856); as well in his oil paintings, a dozen or more, of various scenes in Frederick's life. A trip to Paris in 1867, so the French critics claim, worked a change in Menzel's methods, so that he applied himself more to problems of light and shade. After 1890 he used color less and less and in his pencil drawing broke away from mere line to the use of a cloudy treatment. He was one of the greatest of German artists of his day; and in 1899 he received the Order of the Black Eagle, conferring hereditary nobility. Apart from his historical pictures, mention should be made of the 'Modern Cyclops' (1875), the interior of a Silesian rolling mill, with excellent lights, and of social satires like 'Carnival Morning' (1885). Consult Jordan, 'Das Werk Adolf Menzels' (1895); and lives by Sondermann (1895), and Knackfuss (1897); Singer, 'Drawings of Adolf von Menzel' (London 1908).

MENZEL, Wolfgang, German author: b. Waldenburg, Silesia, 21 June 1798; d. Stuttgart, 23 April 1873. He studied at Jena and Bonn, became a follower of F. L. Jahn and the Turnerei, and was for four years schoolmaster at Aarau in Switzerland. In 1825 he returned to Germany, having already made himself known to the literary world by his 'Elastic Verses' (1823). He edited and contributed to magazines, and wrote a very great number of works, poems, romances, histories, criticisms, political polemics and Christian theology. From 1826 to 1848, and again later, he was editor of the *Litteraturblatt* in Stuttgart. His chief writings include histories of Germany (1825), German literature (1827), German poetry (1858) Europe (1853–57), and the world ('Universal History' 1862–72). He also produced a work of mythological research (1842), a book on the pre-Christian doctrine of immortality (1869), and autobiographical memoirs (1876). He was often involved in controversy, assailing with equal zeal theological rationalists and political radicals. His attacks upon Gœthe and other authors were fully equaled for virulence by the criticisms upon Menzel himself, made by Heine and some of the younger German writers.

MEQUINEZ, or **MEKINEZ,** Africa, a town of Morocco, 40 miles southwest of Fez. It is one of the capitals and the sultan maintains there a palace. There is a historic mosque and many other fine buildings, especially those of the 18th century, when the town was the preferred residence of Sultan Muley Ismail. There is an ancient city wall with nine gates. There are tanneries and potteries. Pop. 30,380.

MEPHISTOPHELES, mĕf-ĭs-tŏf'ē-lēz, a name for the devil, which has been made popular by Goethe's 'Faust.' He was also a chief character in Marlowe's 'Dr. Faustus.' Goethe derived it from an old popular legend, in which it is spelled *Mephistophiles* or *Mephistophilis*. The etymologies of the word are as various as the spelling. Some suppose it to be an irregularly formed Greek compound from the negative *mē; phōs*, light; and *philos*, loving, thus signifying "not loving the light." Others surmise that it may be derived from the Latin *mephitis* and the Greek *philos*, in which case it will signify literally "loving the mephitic vapors of hell." The Mephistopheles of Goethe has little in common with the devil of the popular imagination. He appears, especially in the original form of the drama of Faust, as a real man of flesh and blood, who only preserves those traits of the popular devil of the Middle Ages which are compatible with a true human individuality — as the companion of Faust, as a selfish and malevolent votary of pleasure, always looking to the real, and bringing back Faust by cold and heartless irony, from barren speculation to the enjoyment of the present life.

MER DE GLACE, mār dè glās, France, an Alpine glacier on the northern slope of Mont Blanc, with an area of 16 square miles and an extreme length of about nine miles. It is formed by the confluence of three branches called the Glacier du Géant, the Glacier du Lechaud and the Glacier du Talèfre and is noted for its beautiful scenery. It ends as the Glacier des Bois whence flows the Arveyron River, in the valley of Chamouni. From the village of Chamouni the Mer de Glace is easiest visited and Mont Blanc ascended. The glacier has an average flow of two feet a day during summer and autumn.

MERAMEC SPRING, an unusually large spring in Phelps County, Mo., about seven miles south of Saint James. The water flows as an underground stream in limestone and emerges as a great spring with a flow averaging 125 cubic feet per second.

MERAN, mā-rān', Austria, a celebrated health resort in Tyrol, charmingly situated on the river Passer, near its entrance into the Adige, at the foot of a hill called the Küchelberg. It is the chief town of a small district of the same name. It consists of an old and a new town, the latter with handsome villas and hotels, and numerous fine residences and old castles in the neighborhood. The old town is mainly on the Laubengasse, which is a long, narrow, winding street. The Polish church and other buildings date from the 14th and 15th centuries. It is believed to have been settled originally in the 9th century. Lying in a sheltered situation on the southern slope of the Alps, it possesses a mild and equable climate, and is much frequented in winter by invalids with pulmonary affections. Permanent population 11,570.

MERCADANTE, Saverio, sā-vā'rē-ō mĕr-kā-dān'tā, Italian composer: b. Albamura, 26 June 1797; d. Naples, 17 Dec. 1870. He studied music at the college of S. Sebastiano in Naples under Zingarelli. From flute and violin he turned to vocal music; won great success with a cantata 'L'Unione delle Belle Arti' in 1818, and with an opera 'L'Apoteosi d'Ercole' in 1819; was made chapel-master of the Novara Cathedral (1833) and director of the Naples Conservatory (1840); and in 1862 became totally blind. He wrote many masses and other ecclesiastical music, such as 'The Seven Last Words'; but is best known for his operas, of which the following, out of a total of 50, should be mentioned: 'Elisa e Claudio,' 'Il Bravo,' 'Il Giuramento,' 'I Briganti,' and 'Le due illustri Rivali.'

MERCANTILE AGENCY, a business enterprise, usually an incorporated company, which agrees to furnish subscribers who pay a yearly fee, with information as to the business responsibility, financial standing and credit rating of business houses, whether conducted by private individuals, firms or corporations. They also sometimes have a department for the collection of debts, and sometimes they sell two or three different services, at different prices. The business originated in the United States in 1837, following a financial panic, it being recognized that it was necessary for business houses to obtain better information in the giving of credits. Lewis Tappan was the founder of the first mercantile agency in New York City. The most conspicuous concerns now in the business are R. G. Dun and Company and the Bradstreet Company of New York; a good rating by either is highly prized by merchants. They issue large books, usually once a year, and loan them to subscribers for their own use; in these books appear lists of addresses and the kind of business, followed by letters or signs indicating their financial responsibility, their promptness in paying bills, etc. Subscribers are also entitled to send in for special reports, giving more detailed or later information. The agencies obtain their information — (1) direct from the parties in question, sending a representative to interview them, and asking for a statement, but in no case indicating who wants to know their standing; (2) by inquiry of the concerns from whom the party buys goods; (3) by exchange of information between other agencies or people likely to know their reputation. Concerns that are noted in the agency books as prompt pay, or as being worth $5,000 or more, are usually spoken of as "rated" houses. The highest rating is usually worth $1,000,000 or more, and prompt pay.

In addition to agencies doing a general confidential reporting business on all classes of business houses all over the country, there are others that confine themselves to a particular industry, as Typo, which reports on the houses engaged in printing, publishing and allied industries. The laws recognize that such exchange of information is legitimate, and essential to the conduct of business on a credit basis, and an action for libel in sending out a bad report will not hold against an agency that conducts its business in a fair manner. However, the reports have to be made confidential; if promiscuously circulated, they might become libelous. For it unquestionably happens that at times the agencies report concerns as having less money and less standing than they are entitled to, and they can make mistakes. But as long as they try to be fair, and send out their reports under the seal of confidence, the law protects them. Abuse of the system, to revenge, spite or for blackmail, is practically unknown. The agencies are more apt to err in the matter of continuing to rate concerns too high when their financial standing is impaired. When large concerns have failed it has frequently happened that the mercantile agencies had continued to report them in good standing up to the last. Therefore the credit men of the large houses do not pin their faith entirely to commercial ratings, but use other means wherewith to know the truth. In the very large cities there are credit men's associations, where they confer as to ways and means of keeping credits safe. While there is opportunity for better and more accurate reporting as to credits, it is true that the mercantile agencies of America handle their business extremely well, and constitute one of the most important links in the artificial chain between the industries of the nation. Consult Errant, 'The Law Relating to Mercantile Agencies' (1889); Reinhard, 'A Treatise on the Law of Agency' (1902).

MERCANTILE LAW. See LAW, MERCANTILE.

MERCANTILISM. See ECONOMICS.

MERCANTINI, Luigi, Italian poet: b. Ripatransone, in the Marches, 20 Sept. 1821; d. Palermo, 18 Nov. 1872. Against his inclinations he was intended by his father for the priesthood, but he deserted that vocation before taking orders and turned to school teaching. For a time he was professor of Italian and Latin literatures in Sinigaglia. He wrote a number of patriotic songs, including "I tre Colori," but gained his greatest popularity by the song which is now the Italian national anthem or "Inno di Garibaldi." See GARIBALDI HYMN.

MERCAPTANS (Latin, "taking up mercury") or **THIO-ALCOHOLS,** *in chemistry* a large class of substances having the same constitution as the alcohols, but differing from them by having the oxygen atom in the hydroxyl replaced by sulphur. They are oily liquids or crystalline solids having an offensive, garlic-like odor, and are all insoluble in water. They possess acid tendencies that are more marked than those of the alcohols, and combine with metallic oxides to form salts which are known as "mercaptides." They combine with especial facility with mercuric oxide and take their name from this circumstance. Ethyl mercaptan is the best-known members of the series, and it is this substance that is understood when "mercaptan" is spoken of, without further qualification. Ethyl mercaptan, C_2H_5SH, is prepared by acting upon ethyl chloride, C_2H_5CL, with potassium hydrosulphide, HKS; the potassium atom and the ethyl radical changing places as indicated by the equation $C_2H_5Cl + HKS = C_2H_5SH + KCl$. Ethyl mercaptan is a colorless, mobile liquid, boiling at 99° F. It is very inflammable, burning with a blue flame, and it mixes readily with alcohol and ether, though only to a very slight extent with water. Like the other mercaptans, it forms salts with the oxides of the metals, the hydrogen atom that is associated with the sulphur being the one that is replaced by the metal. The mercury salt, $Hg(S.C_2H_5)_2$, may be prepared very readily by agitating the mercaptan (or its alcoholic solution) with red oxide of mercury, HgO. Its formation is attended by the liberation of considerable quantities of heat, and the mercaptide itself is obtained in the form of soapy white scales. All of the metallic mercaptides are decomposed by hydrochloric acid. The mercaptans of fatty radicals all give a fine green color when treated with a solution of isatin in strong sulphuric acid and this reaction (as well as their insufferable smell) is used as a test for their presence.

MERCATOR, mėr-kā'tȯr, **Gerardus** (Latinized form of GERHARD KREMER), Flemish mathematician and geographer: b. Rupelmonde, Flanders, 5 March 1512; d. Duisburg, 2 Dec. 1594. He studied at Louvain, and became a lecturer on geography and astronomy, making his instruments with his own hands. In 1544 he was arrested for heresy, being liberal in his views. He escaped, but 42 of those arrested with him were burnt alive. Recommended to Charles V, Mercator entered into the emperor's service, and executed for him a celestial globe of crystal, and a terrestrial globe of wood. In 1559 he retired to Duisburg and received the title of cosmographer to the Duke of Juliers. His last years were devoted to theological studies. He is known as the inventor of a method of projection called by his name, in which meridians and parallels of latitude cut each other at right angles, and are both represented by straight lines, which has the effect of enlarging the degrees of latitude as they recede from the equator. The method is convenient in mapping small areas. His first maps on this projection were published in 1569; the principles were first explained by Edward Wright, in 1599, in his 'Corrections of Errors in Navigation,' whence the discovery has sometimes been attributed to him. His 'Tabulæ Geographicæ' (1578) is the best edition of the maps of Ptolemy. See MAP.

MERCATOR'S CHART, or PROJECTION. See CHART.

MERCED, Cal., city and county-seat of Merced County, on the Atchison, Topeka and Santa Fe, the Southern Pacific and the Yosemite Valley railroads, 150 miles southeast of San Francisco. It lies in the valley of the Joaquin and Merced rivers, has a library, sanitarium, county hospital and courthouse. It has extensive farming, dairying, fruit growing and livestock interests. Pop. 3,102.

MERCEDES, mėr-sā'dās, Argentina, town in the province of Buenos Aires, on the Pacific Railroad, about 50 miles west of the city of Buenos Aires. In 1779 it was founded as a military station. An Irish colony settled here about 1800. Mercedes is in a region where the chief occupation is raising sheep and cattle. It has several manufacturing establishments, among which are flour-mills, soap factories and cattleyards. The shipments are principally wool, hides and flour. The town has a public library and a college. Pop. about 22,782.

MERCEDES, Uruguay, a town in the district of Soriano, on the Rio Negro, about 10 miles from where it empties into La Plata, and about 75 miles north of Buenos Aires. Pop. 15,667.

MERCENARIES, or STIPENDIARIES, foreigners or others who received pay for their services as soldiers, especially as distinguished from government soldiers or those owing military service to the crown or nation. Hired professional soldiers appear very early in the history of military organization. Foreign mercenaries appear in the armies of Alexander the Great and the Romans. They were common in all armies, but generally engaged for a single campaign only. In England, Harold had a body of Danes in his army when he defeated the Norwegian king — the hus-carls, a body originally established by Canute. William III had for some time a body of Dutch troops in his pay after he became king of England; and throughout the 18th century Hessian and Hanoverian regiments were constantly in the pay of the British government for temporary purposes. Hessians fought for Great Britain in the Revolutionary War; and the landgrave of Hesse, who sold his troops at so much a head, received upward of $2,500,000 for Hessian soldiers lost in that struggle. Americans have fought as hired soldiers in China, South Africa and in nearly all the countries of Central and South America. They are generally known as "soldiers of fortune." Most of the officers in the regular Chinese army are either Englishmen or Americans. But most famous of all mercenaries were the Swiss soldiers, who were hired, sometimes by the cantons themselves, over all Europe, and formed many famous body guards. They were long employed by the French monarchs; and the Vatican at Rome still has its Swiss guards.

MERCER, mėr'sėr, **Henry Chapman,** American anthropologist: b. Doylestown, Pa., 24 June 1856. He was graduated from Harvard in 1879; was curator from 1894 to 1897 of American and prehistoric archæology at the University of Pennsylvania; honorary member of the United States Archæological Commission, Madrid, 1893. He was editor for anthropology in *American Naturalist,* 1893 to 1897; made extensive investigations and studies in anthropology in America, discovering serveral unknown extinct species, and 1897 to 1917, made and presented to the Historical Society of Bucks County, Pa., an extensive collection of objects illustrating the Colonial and early history of the United States by means of the implements and handiwork of the pioneer settlers. In 1916 he built and presented to the society a fireproof museum for preserving the above collection. He established a pottery at Doylestown, Pa., in 1898, experimented upon and developed the processes of the Pennsylvania Germans for making and decorating pottery, inventing in 1899 a new method of manufacturing tiles for mural decoration and in 1902 a new process for making mosaics; was awarded the Grand Prize, Saint Louis Exposition, 1904, and bronze medal for archæological work, Madrid, 1893; also bronze medal for tile work, Massachusetts Society of Arts and Crafts. He is a Fellow American Association for the Advancement of Science and member of the American Philosophical Society, the Academy of Natural Sciences of Philadelphia, the Numismatic and Antiquarian Society of Philadelphia, Geographical Society of Philadelphia. He has published 'Lenape Stone' (1885); 'Hill Caves of Yucatan' (1896); 'Researches upon the Antiquity of Man in the Delaware Valley and Eastern United States' (1897); 'Tools of the Nation Maker' (1897); 'The Bible in Iron or the Pictured Stoves and Stoveplates of the Colonial United States' (1915).

MERCER, Hugh, American general: b. Aberdeen, Scotland, about 1720; d. near Princeton, N. J., 12 Jan. 1777. Educated as a physician, he served as surgeon's assistant in the army of the Young Pretender at the battle of Culloden. Emigrating in 1747 to America, he settled in Virginia, and resided there, in the

practice of his profession, until 1755, when he volunteered in the expedition led by Braddock to Fort Duquesne. At the outbreak of the Revolution he promptly joined the Continental army, and obtained the rank of brigadier-general. He subsequently accompanied Washington on his retreat through New Jersey, and rendered valuable assistance at the battle of Trenton. In the succeeding action at Princeton he was mortally wounded and died a week later. Mercer County, N. J., was named in his honor.

MERCER UNIVERSITY, Macon, Ga., is an institution having its genesis at a meeting of the Baptist Associations of Georgia, at Powelton, 27 June 1822, held to discuss, among other matters, the question of ministerial education. In 1827, at a similar meeting, held in Washington, Ga., the project was further discussed, and in 1829 Josiah Penfield, of Savannah, bequeathed $2,500 as a fund for education, on condition that the Baptists should raise an equal amount. This was promptly done, and two years later it was resolved to establish "a Classical and Theological School . . . open only for those preparing for the ministry." It was soon seen, however, that the school could not be so restricted, and in 1832 this bar was removed. Mercer Institute was established on a site of 450 acres, at Penfield, in January 1833, with 39 students,—"Penfield" in memory of Josiah Penfield, and "Mercer," after Dr. Jesse Mercer, early conceiver and patron of the school. In 1837 a charter was obtained giving the institution collegiate rank and changing its name to "Mercer University." Thereafter it grew steadily. The successive presidents were B. M. Sanders; Otis Smith; John L. Dagg; N. M. Crawford; H. H. Tucker; A. J. Battle; G. A. Nunnally; J. B. Gambrell and P. D. Pollock. President P. D. Pollock was a most efficient president for seven years, and after a lingering illness died in office. Following him, Prof. Charles Lee Smith, of Missouri, was elected president, served one year and then resigned. Following him, Dr. S. Y. Jameson, of Georgia, was elected president and served efficiently for seven years, resigning June 1913. Prof. J. F. Sellers of the department of chemistry of Mercer University was appointed acting president for one year. June 1914 the board of trustees elected Dr. W. L. Pickard president.

The registration of Mercer University is now over 400; the departments are college of arts and sciences, law, pharmacy, education and a pre-medical course. The university gives the degrees of bachelor of science, bachelor of arts, master of arts, bachelor of law, pharmaceutical chemist and graduate of pharmacy, accredited certificates in education, receives and gives credit on the pre-medical course for a medical degree, and a B.S. degree. The university has the same requirements for entrance and graduation as all the State universities of the South. The campus has in it about 60 acres and nine large buildings, besides a number of cottages. The working plant is valued at $250,000, and the endowment in round numbers is about one million dollars. The work done in Mercer University is fully accredited at such institutions as the University of Michigan, Columbia University, New York, and leading institutions in America and Europe. It is justly regarded as one of the most potent factors in the educational life of Georgia and the South, and is increasing in the number of students and material equipment from year to year. The faculty in 1918 numbered 23.

MERCERIZING AND MERCERIZED COTTON.—A process invented by John Mercer, of Lancashire, England, for treating cotton fibre or fabrics. The system was first patented in 1851. The process consists in steeping the cloth in a solution of caustic alkali. The cloth shrinks about one-fourth and takes more brilliant colors in dyeing than unmercerized cotton goods. Cotton may be mercerized either in the yarn or in the cloth, and a variety of machines are made for this purpose. Some of these machines operating on the cloth employ a tension to obviate same after shrinkage. This gives a greater yardage, but it reduces the gloss. The name has sometimes been incorrectly extended to sizing of cloth to give it a better sheen. True mercerizing gives a lustre to the cotton cloth, because the fibres are drawn closer and flattened, presenting a smooth surface that reflects the light. A variation in the caustic soda process is employed to give the modern crimped or crepe effects. Consult Murphy, 'The Textile Industries' (London 1912).

MERCERSBURG, mĕr'sĕrz-bĕrg, Pa., borough, in Franklin County; at the terminus of a branch of the Cumberland Valley Railroad, about 70 miles southwest of Harrisburg. It was settled in 1730 and was originally called Black Town. It was incorporated in 1821. The borough was enlarged in 1901. It is in a farming section of the county, but has some coal and iron interests. It was formerly noted for its educational institutions, which were under the auspices of the German Reformed Church in America. It is the seat of the Mercersburg Academy, and was the home of James Buchanan (q.v.). Pop. 1,410.

MERCERSBURG THEOLOGY, a school of religious philosophy founded by F. A. Rauch of the German Reformed Church in 1836, the work being taken up by John W. Nevin (q.v.) and Philip Schaff (q.v.). The name comes from the Mercersburg (Pa.) Theological Seminary of the German Reformed Church, where the teaching of this system spread. The Mercersburg theology urged that the Church was not a voluntary society of believers but a historic and spiritual growth — an attitude showing markedly less hostility to the Roman Catholic Church; that old confessions cannot express the modern faith of the Church; that the sacraments are more than symbols; that church worship should be orderly — hence the 'Liturgy' (1858) and 'Order of Worship' (1866); and that religious education is of prime importance. The Mercersburg movement infused new life into the German Reformed Church. Consult Appel, 'Life of John Williamson Nevin' (1889).

MERCHANT, Francis Walter, Canadian educator: b. Oil Springs, Ontario, 1855. He received his education at Toronto University, taught for many years in high schools and collegiate institutes. In 1900–08 he was princi-

of the London (Ontario) Normal School; from 1908 to 1911 was chief inspector of schools in Ontario and in 1911 became director of industrial and technical education in the province of Ontario. He is a senator of Knox College, Toronto.

MERCHANT MARINE OF THE UNITED STATES. The merchant marine of the United States — that is to say, the shipping on ocean, lake and river engaged in the carrying of merchandise, mail and passengers — is the second largest shipping in the world, only the fleet of Great Britain exceeding it. By far the larger part of this American shipping has long been employed in domestic navigation between one American port and another. But the shipping registered for foreign commerce, which after a splendid growth began to decline before the Civil War, began again to increase in 1914 with the Great War in Europe.

America throughout most of its history has been distinctively an adventurous and successful maritime country. For many years after the founding of Jamestown and Plymouth the construction of ships for coastwise and overseas trade was the chief manufacturing industry pursued upon this continent. There was an abundance of stout timber near the water's edge, and the pioneers brought a love of the sea from Great Britain, Sweden and Holland.

Maritime spirit, stirred by necessity, was especially active in the northern colonies. Lord Bellamont, colonial governor, declared in 1698: "I believe I may venture to say there are more good vessels belonging to the town of Boston than to all Scotland and Ireland, unless one should reckon the small craft, such as herring boats." In the colonial era the sea was the easiest highway connecting the long range of settlements that clung to the Atlantic Coast. Small craft — ketches and schooners — ran along shore and to the West Indies, and brigs and ships to the British Isles, France, Spain, Portugal and the Mediterranean. Colonial shipyards made swift improvement in rigs and models, and found a market for their craft abroad. Out of 1,332 vessels built in Massachusetts between 1674 and 1714, 239 were sold for British or foreign registry. In 1724 Thames builders complained that their trade was being destroyed by the emigration of their best mechanics to America.

Shipbuilding and navigation were the most energetic and profitable of vocations, and were particularly encouraged by colonial governments. Bounties were granted for the construction of ships, and shipwrights were exempted from compulsory military service. To spirited youth the sea made irresistible appeal. Sir Joshua Child, chairman of the British East India Company, in his discourse on trade lamented that there were "none so apt as the North American colonies for the building of ships; nor none comparably so qualified for the breeding of seamen, not only by reason of the natural industry of the people, but principally by reason of their cod and mackerel fisheries, and in my opinion there is nothing more prejudicial and in prospect more dangerous to any mother kingdom than the increase of shipping in her colonies, plantations, or provinces."

In response, the British Parliament prohibited the importation of Continental products into the colonies except in English-built ships, and even sought to destroy the colonial trade with the West Indies. The colonists retaliated by forming associations to boycott British manufactures. Against such resistance the repressive British laws failed, and the merchant ships and sailors of America so steadily increased that at the outbreak of the Revolution there were more people in northern New England engaged in shipbuilding and navigation than there were in agriculture.

These merchant ships and sailors proved a powerful resource in the war for independence. The Continental navy as a whole was weak and unsuccessful. In 1781, the seventh year of the war, there survived only nine Continental cruisers carrying 164 guns, while American privateers, converted from merchant ships and owned and managed by merchants, numbered 449, carrying 6,735 guns. These private-armed ships, with merchant officers and crews, in the course of the Revolution seized or destroyed three times as many British vessels as did the regular Continental sloops and frigates. And in the year 1777, when the battles of Bennington and Saratoga were fought, the American merchant seamen afloat in private-armed ships nearly equalled the strength of the army under the immediate command of Washington. These swarming American privateers cruised not only in mid-Atlantic but in the British Channel, the Irish Sea and all around the coasts of the United Kingdom. Their harrying of British commerce brought a stream of arms and supplies to the Continental government and did more than Paul Jones' victories in the *Ranger* and the *Bon Homme Richard* to impress the governments of France and Holland with the vigor and audacity of the American people and the probable success of the American cause.

From dread of the maritime strength of the new republic the British government made war on the American merchant marine as soon as the Revolution itself had ended. An Order in Council barred American ships from the British West Indies, and forbade the importation into the United Kingdom of all but a few products if conveyed in American vessels — it being insisted further that these American vessels should bring only the products of the particular States in which they belonged. British shipowners were forbidden to purchase American-built vessels, which in 1775 were supposed to constitute one-third of the British mercantile marine. "The ministry," it was declared, "suppose they have now put a finishing stroke to the building and increase of American vessels." Lord Sheffield argued that the Barbary pirates of North Africa, preying on defenseless American merchant craft, were really a blessing to Great Britain, and London merchants told Franklin that "if there were no Algiers it would be worth England's while to build one."

Until the new Federal government was established in 1789, British shipowners dominated American ocean commerce. Our merchant shipping registered for foreign voyages amounted to only 123,893 tons in this year 1789, and 76 per cent of our own imports were conveyed beneath foreign colors.

Striking Early Growth of American Tonnage.— Washington and his colleagues felt that this condition was perilous and intolerable, and

Adams, Jefferson and Madison prevailed upon the first Congress under the new Constitution to embody in its very first act, passed on 4 July 1789, "for the support of the government, the discharge of the debts of the United States and the encouragement and protection of manufactures," an important clause allowing a discount of 10 per cent of the tariff duties on all goods imported in ships built and owned by American citizens. Further and heavier rebates were allowed on teas imported direct from the East Indies in American vessels — for the purpose of encouraging an American East India fleet — and, moreover, a sharp preference in tonnage duties was granted to all American vessels, which practically barred foreign vessels from the coastwise carrying trade.

Five years later, in 1794, the discount of 10 per cent of the tariff duties on goods imported in American vessels was changed to an addition of 10 per cent to the duties on goods imported in foreign vessels. For many years thereafter this powerful government preference for American shipping remained the distinctive national policy of the United States. This was justified not only by commercial considerations but by patriotic regard for the national defense. Jefferson, as Secretary of State, wrote in 1794: "To force shipbuilding is to establish shipyards; is to form magazines; to multiply useful hands; to produce artists and workmen of every kind who may be found at once for the peaceful speculations of commerce and for the terrible wants of war."

What followed this vigorous maritime protectionism of the fathers of the republic was a growth of American shipping well described by a historian of the period as "without parallel in the history of the commercial world." American merchant tonnage registered for overseas voyages rapidly advanced from 123,893 in 1789 to 411,438 in 1792, and to 667,107 in 1800, while the proportion of American imports and exports conveyed in American vessels rose from 23.6 per cent in 1789 to 76.4 per cent in 1792 and to 89 per cent in 1800.

The Napoleonic wars had a double effect upon American shipping. In the first place, these wars gave a great opportunity to America, the chief of neutral carriers. But, on the other hand, and offsetting this advantage, both the British and the French governments began an unscrupulous war of seizure and spoliation on American ships wherever bound, while Great Britain ruthlessly impressed American seamen, native and naturalized, into her naval service. Yet American shipping, in spite of all difficulty and danger, grew and prospered until in 1810 the fleet registered for foreign commerce amounted to 981,019 tons, conveying 91.5 per cent of our imports and exports. New York, Philadelphia, Boston and Salem were sending ships to the East Indies. In 1789–90 the *Columbia* made her famous voyage to the Northwest coast and the Orient — the first American merchantman to circumnavigate the globe.

When, tardily, in 1812 the American government declared war on Great Britain, principally to revenge the wrongs of our sailor-citizens, the merchant ships and seamen proved again a tremendously effective weapon, as they had in the first war for independence. The United States navy in the War of 1812 comprised on the ocean only 23 vessels of all classes, mounting 556 guns. These 23 men-of-war captured 254 naval and merchant craft of the enemy. But American merchantmen armed and converted into privateers in 1812–15 numbered 517, mounting 2,893 guns. These privateers, with their merchant crews, took 1,300 prizes, valued with their freights at nearly $40,000,000, or five times the number of the prizes of our regular ships-of-war. Again Yankee shipowners and sailors carried the conflict right to the coasts of the United Kingdom, and attacked rich convoys wherever they could be found. The merchants of Glasgow in September 1814 protested to the Admiralty that "a horde of American cruisers should be allowed, unresisted and unmolested, to take, burn or sink our own vessels in our own inlets and almost in sight of our own harbors." It was the exploits of the privateers chiefly, and not the loss of a dozen frigates and sloops in single-ship duels, that quickly made the British mercantile community thoroughly weary of this second war with the Americans.

British diplomacy at the close of the War of 1812 proved more successful than British armed strength. In a commercial convention framed after the Treaty of Ghent, the United States was persuaded to embark upon a plan of miscalled reciprocity in which both governments bound themselves to grant no more preference to their own ships in the direct trade between American ports and the United Kingdom. At the same time, however, the British government craftily reserved to itself the West India trade and barred American ships out of all but direct trade with British East India possessions. This costly defeat of American diplomacy was sharply resisted by national lawmakers, but the plea prevailed that the terms of the convention really bound the United States and must be confirmed by Congress. Immediately there came a decline in the American merchant marine, and an increase in British maritime prosperity. Conditions were nominally equal but actually unequal, for British vessels could make triangular voyages to the United States, to the West Indies and back to Europe, while American ships could not. American tonnage suffered further by the conclusion of so-called reciprocity agreements with other maritime states of Europe, whose participation in our own carrying trade greatly increased, and whose vessels it was discovered, could be operated at a lower cost because of the lower range of European wages.

But American shipowners did not abandon the uneven struggle. When they lost trade in the north Atlantic they turned to the Northwest coast, to the East Indies and to the mid-Pacific archipelagoes. They built larger and swifter ships which could make three voyages while dull Europeans were making two. American registered shipping, which had fallen since the War of 1812 to 581,230 tons in 1819, rose steadily to 701,517 tons in 1827. In that year the London *Times* said:

"It is not our habit to sound the tocsin on light occasions, but we conceive it to be impossible to view the existing state of things in this country without more than apprehension and alarm. Twelve years of peace, and what is the situation of Great Britain? The shipping interest, the cradle of our navy, is half ruined. Our commercial monopoly exists no longer; and thousands of our manufacturers are starving, or seeking

redemption in distant lands. We have closed the Western Indies against America from feelings of commercial rivalry. Its active seamen have already engrossed an important branch of our carrying trade to the Eastern Indies. Her starred flag is now conspicuous on every sea, and will soon defy our thunder."

Of this era Prof. J. R. Soley, the historian, has written:

"In every respect we may say that this period (1820–28) represents the most flourishing condition of shipping in American history. Although since that time commerce has increased twelve-fold, and although in the year preceding the Civil War our registered tonnage was three times as large, yet we have never since 1830 reached the position in respect to the carrying trade to and from American ports that was maintained during this decade, but, on the contrary, have receded from it further and further."

Success had made our national lawmakers too confident, for in 1828 Congress took another step in miscalled reciprocity by offering to abandon the preferential duty system, under which American shipping had grown so wonderfully, if competing foreign nations would do the same. This change resulted unfortunately, American registered tonnage falling off from 757,998 in 1828 to 537,563 in 1830. Inland States, or those having no large ownership of ocean carriers, had now come to dominate the policy of the American government. British vessels, of which in 1830 only 78,947 tons had entered the United States, now rapidly increased to an average of 212,661 tons. While in the decade 1830 to 1840 American tonnage gained but 40 per cent in all the ports of the world, British tonnage in American ports increased nearly 300 per cent. In 1840 the proportion of American imports carried in American vessels had fallen to 82.9 per cent. Yet ship for ship American wooden vessels were still pre-eminent. Says the British historian, Grantham:

"Previous to the development of steamships, the preponderance of shipping was falling rapidly into the hands of American shipowners. Thirty years ago one of the great objects of interest at the docks in Liverpool was the American sailing packet, and it was considered that a stranger had missed one of the lions of the port who had not visited these celebrated ships. The same prestige was felt everywhere: on the Atlantic and Pacific oceans, in India, China, and in all the best trades American ships were most in demand."

Errors of national policy in the too early reduction and abandonment of the preferential or protective policy of Washington, Adams, Jefferson and Madison had hurt American shipping and checked its normal growth. But, on the other hand, the blunders of the lawmakers had been to a great extent retrieved by the persevering and progressive spirit of the shipbuilders, shipowners and seamen of the United States.

Steamers, Packets and Clippers.— Steam shipbuilding and navigation were first made practicable in America. The *Clermont* of Robert Fulton in 1807 was the first successful steam-driven craft. The *Savannah* in 1819 had made the first steam transatlantic passage. In 1823, when the steam merchant fleet of the United States was first enumerated, it had a total tonnage of 24,879 — engaged almost entirely in coast and river voyages. By 1833 our steam fleet had advanced to 101,306 tons, and by 1840 to 198,184 tons, of which only 4,155 tons were registered for foreign commerce. Moreover, American shipbuilders, contrary to frequent assertions, were quick to recognize the value of iron, and the first iron sea-going steamer, the *Bangor,* was built at Wilmington, Del., in 1844. Nevertheless, with all this spirit of energy and progress, American shipping faltered when it ceased to receive some degree of preference from its own government. Our shipping, still nearly all wood-built and sail, registered for foreign commerce stood at a tonnage of 904,476 in 1845 — a handsome total but less than the 981,019 tons of 1810. The growth of our merchant shipping had fallen behind the growth of population. In 1810 the United States had owned 13.43 cubic feet of registered tonnage per capita. In 1845 it owned only 4.54 cubic feet per capita.

In 1840 British steamships launched and driven by subsidies — a subject considered elsewhere — had appeared on the route between America and Europe, and also in British trade with the West Indies, South America and the East Indies. Up to that time the transatlantic fast freight, passenger and mail service had been dominated by the American flag. Nearly all of the lines of sail packets were of United States ownership and construction. The Black Ball line, the Swallowtail line, the Dramatic line, the Red Star line, the Williams and Guion line and others employed vessels comparable in size with the East Indiamen of Great Britain and far superior in speed and handiness. These packets should be carefully distinguished from the clippers which came afterward. Packets were swift but capacious vessels, large carriers for their tonnage, with accommodations in the cabin for first-class and between decks for steerage passengers. They were strongly built of wood, many in New York yards along the East River and others on the Delaware and in New England. Their passenger traffic was carefully regulated by Federal laws. The packets carried the higher cost freight, and their rates were above those of ordinary merchantmen. But they were profitable ships because of the swiftness and regularity of their voyages, the best of which were from 14 to 20 days from New York to Liverpool. The packet era began in the early years of the last century and practically ended by 1860, when steam became supreme — though a few sail packet ships remained in transatlantic passenger and freight service long afterward.

The first real clipper ships of a sharper model, loftier spars and relatively less freight space appeared in 1843, the result of an intensifying rivalry of steam and canvas. Some of these clippers were employed on the New York packet lines, but most of them were engaged in the long-voyage trade to China and India, and particularly in the Argonaut trade to California. It was the California trade preeminently that created the greatest and most famous of American clipper ships from 1850 onward. For this trade the *Sovereign of the Seas,* the *Flying Cloud* and other stately examples of the genius of Donald McKay were constructed. This California trade under historic American laws was American domestic commerce, in which only American vessels could participate. These ships sailed under register as if for foreign trade and indeed often engaged in world-round carrying — proceeding from California across the Pacific to the Orient and loading there for the Atlantic coast of the United States or for Europe. American registered tonnage rose rapidly from 1,258,756 in 1849 to 2,379,396 in 1860. This extraordinary

increase was principally due to the California trade and its demand for ships of high speed and large dimensions. It does not represent any proportionate increase in American overseas carrying, for the 75.2 per cent of our imports and exports conveyed in 1849 in American vessels had shrunk in 1860 to 66.5 per cent. Under miscalled reciprocity the American flag in the decade before the Civil War was not holding its own in the overseas commerce of the United States, though its tonnage was apparently mounting. Moreover, this decade before the war was characterized by the sharpest and most disastrous decrease of American shipbuilding in all our national history.

Decline before the Civil War.— In the year 1855 a total of 583,450 tons of shipping had been launched in the United States, but this had fallen off to 156,602 tons in 1859 and stood at only 214,797 tons in 1860. This decline is all the more significant when it is added that the 381 square-rigged ships and barks built for foreign commerce in 1855 had decreased to 89 in 1859 and to 110 in 1860. Revolutionary movements in Europe in 1848, the Irish famine of 1847 and the Crimean War of 1854–56 had given a temporary impetus to American shipbuilding and navigation because of an exceptional demand for ships for the export of foodstuffs and for immigration and transport service. But when these passing factors had lost their force, an alarming decline set in in our ocean tonnage, in years of peace, under a low tariff policy, before the firing of the first gun of the Civil War.

This decade before the war had witnessed a momentous change from sail to steam and from wood to iron. But, contrary to frequent assertions, it had not found American shipbuilders and shipowners unprepared. The first British Cunard steamships had appeared in 1840 on the route from Liverpool to Halifax and Boston. They were wooden side-wheel craft, with a speed of from 9 to 10 knots and a tonnage of about 1,200. In fresh breezes they were often beaten by the powerful American packet ships, but they had an advantage in light or contrary weather. These Cunard steamers received at first a British mail subsidy of $425,000 a year, which was subsequently doubled. It was manifestly impossible for American steamships of like cost to compete with them without government encouragement. The subject was actively taken up in Congress, and in 1845 and 1847 laws were enacted providing mail subsidies for American lines. The first United States service was from New York to Havre and Bremen, with $200,000 a year for 20 voyages. Other lines were established from New York to the West Indies, to the Isthmus of Panama and in 1848 northward from the Isthmus to California and Oregon. Like the Cunard ships, the vessels employed were wooden side-wheel steamers, of from 1,000 to 2,400 tons. They were designed and built principally in New York by skilful builders, who had created the famous packet and clipper fleet. In 1847 a contract was concluded with Edward K. Collins and his associates for a first-class steamship line from New York to Liverpool, with a subsidy of $385,000 a year, subsequently increased to $858,000. The Collins steamers were much larger than the Cunard ships, or of 2,800 tons. Under such government encouragement ocean steamship building rapidly increased in the United States. In 1849 our deep-sea steam fleet had amounted to 20,870 tons, but in 1855 had grown to 115,045 tons — so that our ocean steam fleet and Britain's were practically equal, though America's represented by far the more rapid and successful development. The Collins liners uniformly beat their British rivals on the route to Liverpool and secured the bulk of the first-class passenger and freight traffic.

For reasons set forth in detail elsewhere in the article on steamship subsidies, the mail subventions were taken away from the American lines in the crisis of their rivalry with their British competitors, when every advantage seemed to favor the flag of the United States. One by one the American lines succumbed — except those to the West Indies and the Isthmus of Panama, which came partly within the protection of the coastwise service. The Stars and Stripes had vanished from the regular year-round steam trade of the north Atlantic before the Civil War began. The blow which Congress struck against American steamship lines was in part responsible for the sinister decrease in American shipbuilding that marked the half-decade from 1855 to 1860.

The Civil War did not destroy the American merchant marine. That war found our merchant marine already decreasing. What the war did do was to accelerate a tendency that had already developed. Anglo-Confederate cruisers like the *Alabama* and the *Florida* destroyed only 110,000 tons of American shipping all told, but created, as it was intended that they should do, such an extraordinary insurance hazard for other American ships that they could not profitably be sailed beneath the Stars and Stripes — so that in the four years of the war 751,595 tons of shipping, or about one-third of our entire fleet registered for deep sea carrying, was sold to European shipowners. In 1861 our shipping registered for foreign commerce amounted to 2,496,894 tons and in 1866 there remained only 1,387,756 tons. Wreck and wear and tear accounted for part of the loss, and many American shipyards had been forced to abandon merchant work for naval construction.

The Geneva award of $15,500,000 against the British government for British complicity in the work of commerce-destroying probably covered the actual value of the ships and cargoes seized by the *Alabama* and her consorts, but did not make good the vastly larger sums of money lost by those American shipowners who were forced by these depredations to pay excessive insurance rates or accept unremunerative freight rates or lay their ships up in idleness or sell them at one-half or one-third of their cost to foreigners. That award did not make good what American shipowners suffered from the diversion of their accustomed trade to European carriers.

The disastrous consequences of active British sympathy with the Confederacy and British raiding of our maritime commerce far outlasted the Civil War. Not only were the *Alabama*, *Florida*, *Shenandoah*, etc., British-built, but they were armed with British guns and partly officered and almost altogether manned from the British naval and mercantile service.

In the Civil War it was the American mer-

chant marine that enabled the United States government to maintain that close blockade of Southern ports which was so strong a factor in the final defeat of the Confederacy. More than one-half of the steamships, four-fifths of the officers and five-sixths of the men engaged in this vital work came directly from the merchant service. Masters and mates of American steamships and sail ships gave the navy 7,500 volunteers officers, the best educated and most skilful men of their calling in the world, and these officers were followed into the war fleet by more than 50,000 merchant seamen. Without the great resources of the American merchant marine of 1861, the quick and sustained expansioin of the United States navy would have been impossible. Until new cruisers were built, the fastest and the most efficient steamers of the blockade fleet were vessels from the coastwise and West India lines, and these lines supplied besides an adequate fleet of supply craft and transports.

Stagnation after the War.—For a few years after the Civil War, American ocean shipping seemed to gain new headway, though between 1861 and 1865 European shipowners utilized the opportunity to strengthen their grip on the chief trade routes of the world. American merchants and shipbuilders fought with energy and courage, and our registered tonnage rose in 1867 to 1,515,648, and remained at or near that figure for a decade thereafter. In 1878 the total registered tonnage was 1,589,348. American steamships without government aid could not compete on the great mail lines with British or French steamships subsidized by their governments. In the case of Great Britain these subsidies, liberally continued for many years, had given a powerful stimulus to iron shipbuilding and engine and boiler construction, and yards which were originally developed by the demands of the mail contracts had turned to building steam freighters of the slow but useful and familiar "tramp" type.

Following the apparent line of least resistance, American shipowners and builders swung from the extreme clippers of the decade before the Civil War to so-called medium clippers, particularly for the Cape Horn and other long-voyage trades. These medium clippers were not so fast as their racing predecessors, but had a greater capacity for cargo, with more strength and seaworthiness. For a long time these large American wooden sail ships successfully competed with British iron sail ships, but were finally driven from the seas, first by insurance discriminations enforced against wooden hulls by the British Lloyd's, and then by the liberal subsidies provided for sail ships by the French government. Except for a few inadequate and short-lived mail subsidies like those to the Brazil line and the Oriental service of the Pacific Mail, no national aid whatever was given to American ocean shipping from 1865 until 1891. A subsidy system similar to Great Britain's was strongly urged by the maritime and commercial States, but was regularly defeated by the influence of European steamship interests and the opposition of the agricultural South and West in Congress.

But in 1891 both the Senate and the House passed a cautious mail subsidy measure granting subsidies for postal lines of steamers. This legislation, however, was so seriously crippled by the insistence of Western lawmakers on reducing the original rates in the House of Representatives that though the measure has maintained a fast American mail line to Europe and several other lines to the West Indies and to Australasia, it has failed of any more extended purpose. This is the legislation which, coupled with the admission of the British-built *New York* and *Paris* to American registry, made it possible for the International Navigation Company to undertake in 1895–96 a weekly American mail service from New York to England and France. The Ocean Mail Act of 1891 maintains also the Ward line of American steamers from New York to Cuba and Mexico, the Red D line from New York to Venezuela and the Oceanic line from San Francisco to Australasia. Total expenditures under this act in recent fiscal years have been from $1,000,000 to $1,200,000 a year, or less than half of the amount expended for like purposes by the government of Canada, and one-fifth or one-sixth of the total mail subsidy payments to the 30 lines of British postal steamers which constitute the backbone of the British mercantile marine.

President Roosevelt in 1904 earnestly recommended an investigation by Congress of the causes of the decline of the American merchant marine, with a view to recommending remedial legislation. A Merchant Marine Commission of five senators and five representatives, of which Senator J. H. Gallinger of New Hampshire was chairman, was authorized by Congress and published its report in 1905, urging national encouragement to regular steamship services to the West Indies, South America, South Africa, Australasia and the Orient, and the granting of tonnage bounties to cargo vessels. A bill carrying these provisions passed the Senate, but the bounty to cargo ships was eliminated in the House, and every subsequent effort to enact even legislation for mail lines was defeated in the House, though by the slenderest of majorities. Again, as before the Civil War, a large part of the agricultural South and West resisted any and every form of national aid to the ocean shipping industry, and again this opposition was reinforced by the formidable influence of the European steamship organizations which were now monopolizing nine-tenths of the ocean carrying trade of the United States.

A Trial of "Free Ships."—A policy of "free ships," or the free admission of foreign-built vessels to American registry for at least the overseas trade, had found some advocacy for many years in the press and in Congress, and on 24 Aug. 1912, in connection with the Panama Canal Act, the Senate and House changed the traditional policy of the nation by offering free registry for the overseas trade to foreign-built vessels of American ownership not more than five years old, and capable of carrying dry and perishable cargoes. The new expedient absolutely failed. Up to the outbreak of the war in Europe on 1 Aug. 1914, not one foreign-built ship had sought and secured register under this legislation. The reason assigned was the higher cost of operation that would have to be assumed under American laws and regulations. About 1,000,000 tons of ocean shipping, it is estimated, were owned and controlled in 1912 by American capital, but navigated under for-

eign flags to take advantage of foreign mail subsidies or of the lower range of foreign shipboard wages.

But when the European War broke out, many of the American owners of this foreign tonnage, particularly of that part of it under British or German colors, sought the protection of the flag of the United States in order to escape capture by the enemy. Therefore, Congress, on 18 Aug. 1914, passed as an emergency measure an act amending the previous act, broadening its provisions and authorizing the President to suspend the requirement of law that the officers of these foreign-built ships should be American citizens. These foreign-built ships admitted to American registry were further exempted from compliance with our inspection and measurement laws and regulations.

A great many foreign-built craft sought American registration under this measure. It was discovered that the hoisting of the American flag was the signal for a demand from foreign officers and crews for the wage scale and food scale of Americans. The result was an immediate and large increase in the cost of manning and maintaining these foreign-built ships, so that they came upon the same basis as American ships of native construction. It was demonstrated, therefore, that a free-ship policy in itself could not suffice to solve the problem of the American merchant marine in overseas trade. Though nearly all maritime governments, as the great war drew on and as the need of ships became more pressing, enacted laws forbidding the transfer of vessels to foreign purchasers, yet before this action was taken a considerable fleet of foreign-built vessels had been naturalized under the Stars and Stripes. This reinforcement from foreign fleets and the diversion of large coastwise carriers from domestic trade to overseas navigation, due to the high freight rates that had prevailed since the war began, suddenly and greatly increased the amount of American tonnage registered for foreign carrying from 1,066,288 on 30 June 1914, to 2,185,008 on 30 June 1916. In these same two years the proportion of American imports and exports carried under the American flag had risen from 9.7 per cent to 16.3 per cent.

A Swift War Growth.—The European War brought to the United States such a sharp realization of the need of a greatly increased fleet of American ships as the "delivery wagons" of American commerce, that immediate and positive action was demanded from Congress. This took the form at first of a proposal for ambitious government ownership and operation of merchant vessels, for the purchase or construction of which it was provided that $50,000,000 should be at once appropriated. But the principle of government participation in the merchant shipping business was so earnestly opposed in Congress and by the mercantile community that the law finally passed on 7 Sept. 1916 contained as its main feature authority for the appointment of a United States Shipping Board, which should have the power to supervise ocean freight rates for the purpose of preventing unjust combinations of ocean carriers or the exaction of excessive charges.

This Federal Shipping Board was given, moreover, general authority over the merchant marine, and was authorized to devise the best methods to increase it. Government ownership and operation of merchant tonnage was reduced to a minimum, with the stipulation that no ship should be purchased by the government unless it were about to be withdrawn from American commerce without an intention on the part of the owner to return it within a reasonable time and that no ship controlled by the government should be operated by the government unless private capital could not be persuaded to employ it. Moreover, the operation of any vessel on the part of the United States must cease at the end of five years from the conclusion of the European War. The government, however, was authorized by the new law to continue indefinitely to purchase, lease, charter or transfer vessels to be employed by private shipowners, and was even authorized to secure foreign-built vessels for operation in the coastwise trade of the United States.

When on 6 April 1917, the United States itself entered the war, it was recognized that an extraordinary effort must be made to support our Allies with food and munitions, and also to transport our American army to Europe and to sustain our troops with their essential equipment and supplies after they had landed. Therefore, the new Shipping Board, on 16 April 1917, organized the Emergency Fleet Corporation for the carrying out of the vast program of ship construction that had become imperative. There were at that time 37 shipyards building steel vessels and 24 yards building wooden seagoing vessels in the United States. In these yards were 235 shipways. In the presence of war, the previous reluctance to give national aid to maritime industry suddenly vanished. The Emergency Fleet Corporation advanced generous funds for the expansion of existing shipyards and the creation of new yards, and enormous contracts for new tonnage were distributed to builders on the Atlantic and Pacific coasts, the Great Lakes and the Gulf of Mexico. The major part of these contracts called, of course, for steel-hulled ships but after some hesitation the building of several hundred wooden steamers was also authorized, in the full understanding that steam-driven wooden craft of large dimensions were inferior to steel ships for overseas service, but in the conviction that Lloyd George's call for "ships, ships and yet more ships" for the desperate need of the Allies justified the unusual expedient.

Though unforeseen difficulties delayed the work on both steel vessels and wooden vessels, yet the extension of old and the creation of new yards, the launching of hulls and the fabricating of machinery were forced with such zeal that at the signing of the armistice on 11 Nov. 1918 there were 341 shipyards and 1,284 launching ways in the United States. The number of workmen in American shipyards had increased from 45,000 to 380,000. The shipbuilding capacity of the United States had become far greater than that of the United Kingdom. On 31 Oct. 1918 no fewer than 106 steel steamers of 6,000 gross tons or over were under construction in American yards as compared with 66 of 6,000 gross tons or over in British yards.

The total construction added to the American merchant marine during the 19 months of America's participation in the war comprised 875 vessels of 2,941,845 gross tons. In addition, the United States possessed at the end of the war 88 vessels of 562,005 gross tons which had been taken over from enemy nations. Congress had made available for the work of the Shipping Board and the Emergency Fleet Corporation about $4,000,000,000 of national funds, to be expended in the purchase and building of ships, the extension or creation of shipyards, the operation of ships and the training of American officers and seamen. In part the rapidly increased fleet was manned from the Navy and the Naval Reserve.

RECORD OF REGISTERED AND ENROLLED AND LICENSED AMERICAN TONNAGE WITH PROPORTION OF FOREIGN TRADE CARRIED IN AMERICAN VESSELS.

Tonnage registered for foreign trade		Tonnage enrolled and licensed for coastwise trade		Proportion of American imports and exports carried in American vessels	
Year	Tons	Year	Tons	Year	Per cent
1789...	123,893	1789	68,607	1789	23.6
1800...	667,107	1800	272,492	1800	89.0
1810...	981,019	1810	405,347	1810	91.5
1820...	583,657	1820	588,025	1820	89.5
1830...	537,563	1830	516,979	1830	89.8
1840...	762,838	1840	1,176,694	1840	82.9
1850...	1,439,694	1850	1,797,825	1850	72.5
1860...	2,379,396	1860	2,644,867	1860	66.5
1870...	1,448,846	1870	2,638,247	1870	35.6
1880...	1,314,402	1880	2,637,686	1880	17.6
1890...	928,062	1890	3,409,435	1890	12.8
1900...	816,795	1900	4,286,516	1900	9.3
1910...	782,517	1910	6,668,966	1910	8.7
1914...	1,066,288	1914	6,818,363	1914	9.7
1915...	1,862,714	1915	6,486,384	1915	14.3
1916...	2,185,008	1916	6,244,550	1916	16.3
1917...	2,440,776	1917	6,392,583	1917	18.6
1918...	3,599,213	1918	6,282,474	1918	21.9

Before the war, in 1914, good steel cargo steamers could have been built in America for about $65 per deadweight ton. Because of the war increase in materials and wages, the relative inefficiency of many of the new shipyards and their workmen due to inexperience, and the pressure of the war emergency, the Emergency Fleet Corporation was compelled to pay from $150 to $200 per deadweight ton, and even more, for the construction of steel cargo steamers of the same general character. It was very clearly demonstrated that allowing foreign shipowners to carry our imports and exports for so many years had proved in the end not an economy but an extravagance.

On 27 March 1919 Chairman Edward N. Hurley of the United States Shipping Board formally proposed a plan for the future operation of the new government-owned American merchant fleet, which by 1921, including ships bought, built and contracted for, would amount to 2,000 vessels of about 10,000,000 tons gross register. Mr. Hurley urged that the ships should be sold at the world-price to private shipowning companies in which the government should be represented by one director, that 25 per cent of the purchase price should be paid down, and the remainder paid in instalment through a 10-year period — the government meanwhile to be protected by a mortgage which should have priority above all other liens. Chairman Hurley further recommended a method by which a merchant marine development fund could be provided for, to assist American shipping on routes where the service might at first be unprofitable.

It is in the deep sea or registered tonnage that is embodied the real problem of our merchant marine. The coastwise or enrolled and licensed shipping of the country, as distinguished from the foreign-going or registered shipping, has had a steady, constant growth under the national policy which from 1789 onward had reserved domestic carrying on ocean, lake or river between American ports to ships of the American flag and of American construction. In spite of the unparalleled railroad development of the United States, American domestic shipping had grown from 68,607 tons in 1789 to 6,818,863 tons in 1914 — incomparably the greatest coastwise shipping in the world, greater than the entire coastwise and overseas tonnage of the German Empire in 1914, or equivalent to threefold the entire tonnage of France or Norway and fourfold the tonnage of Japan before the war. The progress of this immense domestic shipping has been singularly uneventful, and more than one-third of its tonnage is to be found on the great northern lakes, where an enormous movement of iron ore, coal and grain has demanded carriers of the heaviest dimensions.

Many of the present coastwise steamers on the Atlantic and Pacific have been employed in naval auxiliary service as ammunition ships, fuel ships, general supply ships and transports, and the specific requirement is made in the Ocean Mail Law of 1891 that all subsidized American steamers in the foreign trade shall be built on designs approved by the Navy Department, and be turned over to the government in war.

The new shipping law of 7 Sept. 1916 provides that vessels built, purchased, leased or chartered under this legislation shall be so far as possible adapted "for use as naval auxiliaries or army transports or for other military or naval purposes."

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WINTHROP L. MARVIN,
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MERCHANT MARKS. See MONOGRAM; TRADEMARK.

MERCHANT OF VENICE, The. 'The Merchant of Venice,' entered in the stationer's register in 1598, and published in quarto form in 1600, was written about 1594 or 1595. Several stories that had long had currency in the world — notably the story of the caskets as a device for the choice of suitors by a wealthy heiress, and the bond story of the rich Jew and his debtor — are happily blended in this play, and thereto are added the story of the rings, the romantic minor plot of Lorenzo and Jessica, and the comic character of Launcelot Gobbo. Shakespeare never constructed a better plot, or one better calculated to win popular approval. It meets every demand of stage-management. Although the two main incidents — the choice of the caskets and the pound of flesh — are almost childishly absurd, they are made to seem probable and even natural by the romantic atmosphere in which the characters move. Whether walking the streets of Venice or watching the moonlight sleep sweetly upon the banks of fair Belmont we breathe the air of the Renaissance in Italy. All the characters fit in perfectly with this background except Shylock. Unquestionably to an Elizabethean audience the impression made by him was partly humorous and not at all typical. With his huge nose and the red wig of the traditional Judas he was fair game, not only for the characters in the play, but for those in the pit. His practice of usury and his Jewish qualities rendered him the legitimate object of hatred and ridicule — his passionate words of rage only increased the laughter of an Elizabethean audience. While Shakespeare gave sufficient ground for this interpretation of the character, he has so humanized him as to produce a different effect on a modern audience. His famous words, "Hath not a Jew eyes, etc.," are an instinctive protest against race hatred and in favor of social sympathy. Whatever may be doubtful in the interpretation of Shylock, there is none in the interpretation of Portia. There is no better illustration of the power with which Shakespeare transformed his material than in the change of Portia from "a piratical and widowed siren, who persuades merchants to stake their all against her hand that they will possess her person, and who then drugs them at supper" into one of the most charming characters of all times. Her beauty of person, brilliancy of intellect, nobility of soul, and gift of poetical expression, all combine to produce an effect not surpassed by any other creation of the dramatist. She is the bond of union between the casket story and the pound of flesh story, and all the other characters group themselves naturally about her. The concluding scene of the play at Belmont, after the excitement of the trial scene and the disappearance of the sinister character Shylock, is one of the supreme passages of poetry in the language — almost magical in its beauty of background and expression.

EDWIN MIMS.

MERCHANT VESSELS, Neutral, Rights of. In time of war neutral merchant vessels are entitled to navigate the high seas as in time of peace although in the interest of belligerents they are subjected to certain restrictions such as the liability to search by belligerent cruisers for the purpose of ascertaining whether they are carrying contraband to the enemy or seeking to run a blockade. See BLOCKADE; RIGHT OF SEARCH.

No belligerent may lawfully declare a portion of the high seas to be a war zone within which neutrals shall be excluded from navigating, although he may warn them that a certain portion of the high seas is to be a theater of naval operations and that they will be exposed while traversing it to the dangers incident to the conduct of such operations therein. Within such area belligerents have no greater right of visit, search or capture in respect to neutral vessels than they have anywhere else on the high seas. It is also doubtful whether belligerents have a lawful right to plant mines in the open seas in such a way as to expose neutral vessels to the danger of destruction while innocently navigating the waters thereof, although it is to be regretted that the Second Hague Conference declined to adopt a proposal of the British delegation prohibiting the laying of mines in the open seas. See SUBMARINE MINES.

Neutral vessels have a right to enter the ports of a belligerent so long as they are not blockaded and they may transport supplies to and trade with such ports, subject to the rules governing traffic in contraband goods. (See CONTRABAND). Whether neutral vessels may in any circumstances be destroyed by a belligerent was much discussed during the World War. The question was first raised during the Russo-Japanese War of 1904–05 on account of the sinking by a Russian cruiser of the *Knight Commander*, a British merchant vessel, a portion of whose cargo consisted of contraband goods consigned to ports in Japan. The Russian commander justified his act on the ground that on account of lack of coal and inability to spare a prize crew he could not send the ship into a home port for adjudication by a prize court, hence his only alternative was to allow the prize to go free or destroy it. The act aroused intense indignation in England and was denounced by Lord Lansdowne as "a very serious breach of international law." The Russian contention, he asserted, would justify the wholesale destruction of neutral ships taken by a cruiser at a distance from her base for the reason that she could not spare a prize crew or lacked a sufficient supply of coal. Seven other neutral merchantmen were destroyed by the Russians during their war with Japan. During the recent war German naval commanders have acted on the Russian theory and have generally destroyed their prizes, neutral as well as enemy vessels, because it was impossible to take them in for adjudication. (See the article on CONTRABAND for a discussion of the cases of the *Frye* and the *Maria*).

In no war of the past have neutral merchant vessels suffered so heavily as in the present one. More than 800 neutral ships, American, Danish, Dutch, Greek, Italian, Norwegian, Portuguese and Swedish, were sunk while peacefully navigating the high seas—in most cases by German submarines or cruisers. In a few cases the destruction was due to error but in the majority of cases the reason alleged was that the vessels were carrying contraband. The naval regulations of most states authorize the destruction of prizes under certain circumstances and some of them make no distinction between enemy and neutral vessels. Thus the American instructions for blockading vessels and cruisers in 1898 (Art. 28) authorized destruction of prizes which for "controlling reasons" such as unseaworthiness, existence of infectious diseases, and lack of a prize crew could not be sent in for adjudication. Likewise, if there was imminent danger of recapture the prizes might be destroyed. The prize regulations of many other states contain somewhat similar provisions. The German prize code authorizes destruction of neutral vessels for carrying contraband, for breach of blockade or other unneutral service, if the taking of the ship in would expose the captor to danger or impede the success of his operations; if, for example, the captured vessel is unseaworthy or is unable to follow the captor, or in case the captor cannot spare a prize crew or has an insufficient supply of coal or is near the enemy's coast (Art. 113). Many writers on international law however deny the right of belligerents to destroy neutral prizes. The question was discussed at length at the Second Hague Conference but on account of the divergence of views there expressed, no agreement was reached. It was again discussed at the London Naval Conference in 1908–09. The British delegation proposed as it had done at The Hague in 1907 that the right of belligerents to destroy neutral merchant vessels be prohibited in all cases whatsoever and it was supported by the Japanese delegation. The proposals of most of the other powers, however, recognized the right to destroy in certain exceptional cases and this view finally prevailed. The rule adopted affirmed the general principle that a neutral vessel cannot be destroyed but must be taken into a prize court for adjudication. Nevertheless, by way of exception, the right to destroy was admitted in cases where conveyance of the prize to port would involve danger to the captor or to the success of the military operations in which he was at the time engaged (Art. 49). The effort of the British delegation to obtain an express affirmation that inability to spare a prize crew should not constitute a sufficient justification for destruction failed to receive the approval of the Conference. By article 40 of the Declaration it was provided that a vessel carrying contraband is liable to condemnation, and consequently to destruction, when more than half its cargo consists of contraband goods. Not all vessels carrying contraband therefore may lawfully be destroyed. The rules adopted by the Conference, although representing a compromise between two conflicting views, undoubtedly provided some safeguards against arbitrary destruction of neutral vessels. While the Declaration has never been ratified by any government represented at the Conference the various belligerents put it into effect at the outbreak of the present war with certain modifications, none of which, it appears, altered the rules regarding destruction of neutral vessels. See MINES, SUBMARINE; CONTRABAND; RIGHT OF SEARCH; WAR ZONES.

JAMES W. GARNER.

MERCHANT VESSELS, Transfer of from Belligerent to Neutral Flags. On account of the liability of enemy merchant vessels to capture, their owners frequently at the outbreak of war or when war becomes imminent between their own country and a foreign power seek to withdraw them from the risk of capture by transferring them by sale or otherwise to neutral registry. Are belligerents bound to recognize the lawfulness of such transfers and refrain from capturing enemy vessels so transferred?

The practice of states has not been uniform in respect to such transactions. British and American practice has heretofore admitted the validity of such transfers made during or in contemplation of war provided they were bona-fide, that is, if the transfer was a fully perfected transaction, in which the purchase price had passed from the purchaser to the former owner, the ship being actually delivered and duly registered in accordance with the registry laws of the state whose flag it was to fly, the former owner reserving no interests or title in the vessel so transferred. Consult the cases of the *Benito Estenger,* 176 U. S. 568 (1899); the *Sechs Geschwestern,* 4 c. Rob. (1801); the *Baltica,* Spinks Prize Cases, 98 (1856); and the *Ariel,* Moore's Privy Council Cases IX, 128 (1857).

During the American Civil War large numbers of vessels under American registry were transferred to neutral flags in order to avoid capture by Confederate cruisers. During the war between Chile and Peru in 1879 and the conflict between France and China in 1883 many vessels were transferred to American registry for similar reasons. During the Crimean War a number of Russian vessels were transferred to the American flag and the validity of the transfers were generally sustained by the British prize court.

The French and Russian rules, however, have heretofore denied the legality of all such transfers made after the outbreak of hostilities. At the London Naval Conference of 1908–09 an attempt was made to harmonize the conflicting views and certain rules governing the validity of such transfers were agreed upon and adopted by the conference. By article 55 of the Declaration of London transfers to neutral flags *before* the outbreak of war was recognized to be valid unless it was proved that the transfer was made in order to evade the consequences to which an enemy vessel, as such, is exposed. The Declaration laid down certain presumptions of intent to evade the consequences of capture, as where the bill of sale is not on board in case the transfer has been made less than 60 days before the outbreak of war. But these presumptions were declared to be rebuttable by evidence showing the contrary intent. The onus of proving that the transfer was made for the purpose of avoiding capture was placed on the captor, not on the owner. To be valid in any case the sale must be

unconditional, complete and in conformity with the laws of the countries concerned.

By article 56 of the Declaration transfers made *after* the outbreak of war were declared to be void unless it was proved that they were not made to evade the consequences of capture. Certain absolute and irrebuttable presumptions of invalidity were laid down, such as where the transfer was made in a blockaded port or during the course of a voyage or where the right to repurchase the vessel was reserved by the vendor. Unlike the rule governing transfers before the outbreak of war, the rule as to transfers made during the war is based on the presumption that the transfer is void and the onus of proving the contrary is on the owner rather than on the captor.

The Declaration of London, however, never having been ratified, its rules relating to transfers were not legally binding on the belligerents during the World War. There being no general rule as to the right of transfer from belligerent to neutral flags, each belligerent was free to apply its own rule.

The question of the validity of transfers made during the World War was raised in the case of the *Dacia* in 1915. This vessel was a Hamburg-American liner which, while lying in an American port, after the outbreak of the war, was purchased by an American citizen and admitted to American registry in pursuance of a recent act of Congress authorizing the admission to American registry of foreign-built ships. Subsequently while on a voyage from New York to Rotterdam the *Dacia* was captured by a French cruiser and placed in the custody of a prize court which condemned it and ordered it to be sold. The prize court applied the old French rule which denies the legality of transfers made during war. It might, however, have treated the Declaration of London as binding and then condemned the ship on the ground that the transfer was made with a view to evading the consequences of capture. Had the *Dacia* been captured by a British cruiser the British prize court could hardly have condemned it without departing from the precedents set by Lord Stowell and Dr. Lushington in the earlier cases. It was doubtless owing to this fact that the *Dacia* was by prearrangement between the British and French authorities captured by a French cruiser and sent to a French prize court for trial, thus ensuring it certain condemnation.

The Administration Ship Purchase Bill which was before Congress in 1915 raised the question whether the purchase after the outbreak of the war of belligerent merchant vessels by a corporation, a majority of the stock of which was owned by a neutral government, would be an unneutral act and whether the opposing belligerent would be bound to recognize the validity of such transfers. It was the avowed intention of the supporters of the bill that in case it became law purchases of German merchant vessels then laid up in American ports should be made and the vessels so purchased should be admitted to American registry.

The view was expressed by Mr. Lansing, then counsellor of the Department of State, and by Senators Lodge, Root, McCumber, Burton and others that such transfers would not have been in accord with the principles of neutrality since neutral governments are forbidden to do many acts which it is permissible for neutral individuals to do. It was unofficially announced in England and France that the British and French governments would not recognize the validity of such transfers and that in case any enemy merchant vessel were purchased by the proposed corporation and appeared on the high seas under the American flag they would be captured and put into a prize court for the purpose of testing the validity of the transfers. The failure of the bill to become law removed what would doubtless have become a source of controversy between the United States and Great Britain and France. Tested by the rules of strict neutrality the proposed purchase by a corporation, controlled by the government of enemy ships which had been driven from the high seas to take refuge in neutral ports to avoid capture and the sending of those vessels on the high seas under the protection of a neutral flag would undoubtedly have been an unneutral act against which injured belligerents could justly have complained.

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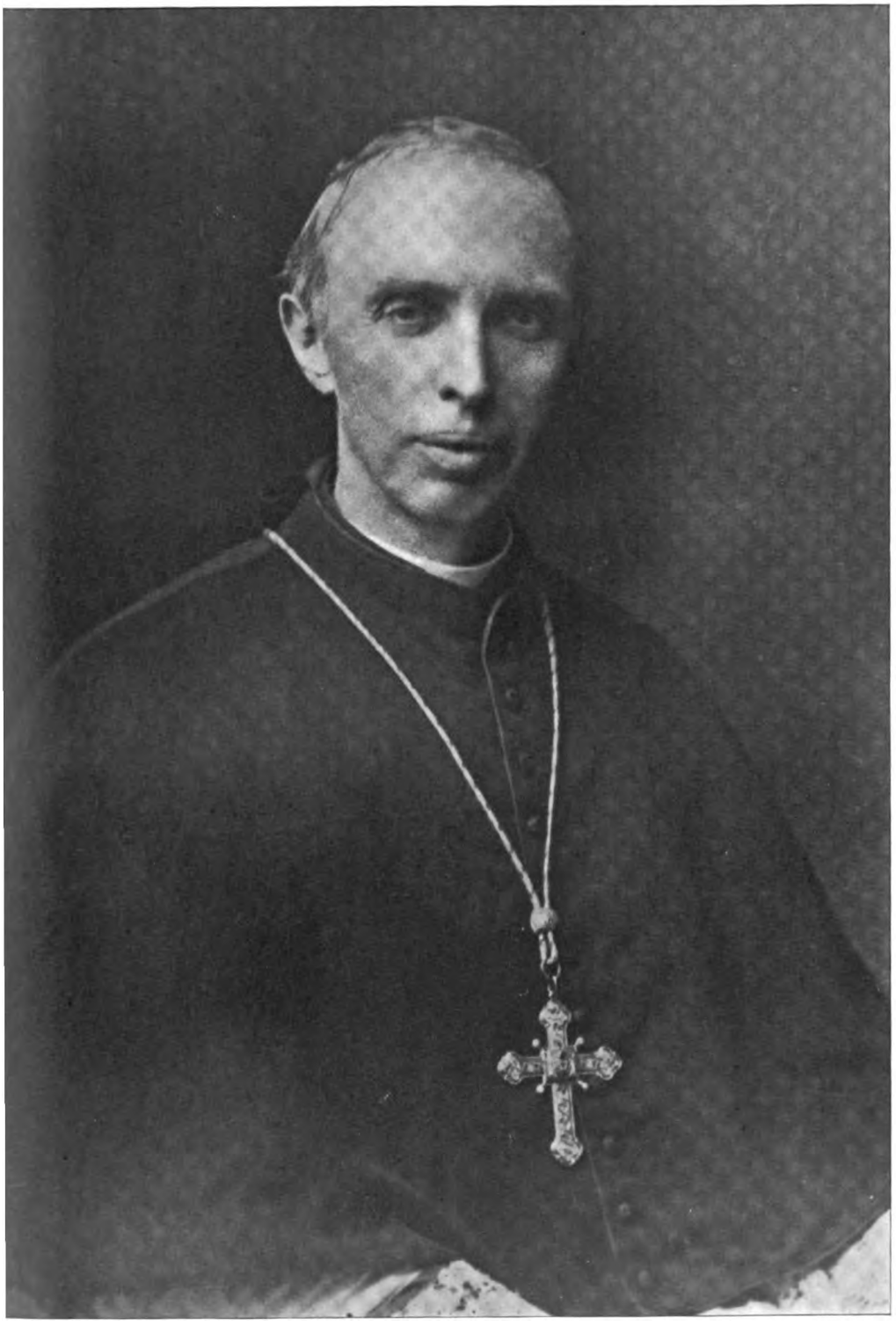
JAMES W. GARNER.

MERCIA, mėr'shi-ą, England, the largest kingdom of the Saxon heptarchy, now comprised in the Midland counties on both sides of the Trent from the North Sea to Wales. Mercia was founded by Crida in 585. Like the other Anglo-Saxon kingdoms it had a stormy history, being almost continually at war with some of its neighbors. In 827 it was conquered by Egbert, who united the different kingdoms of England into one. As its frontiers extended to those of the other kingdoms, as well as to Wales, it derived its name from that circumstance (Anglo-Saxon *mearc*, march or boundary. See ENGLAND, *Geographical History*.

MERCIE, Antonin, äṅ-tō-năṅ mėr-sē, French sculptor and painter; b. Toulouse, 30 Oct. 1845. He studied under Jouffroy and Falguière; won the first Prix de Rome in 1868, and in 1872 obtained a medal of the first class for his bronze statue of the young David, now in the Luxembourg. His masterpiece was 'Gloria victis' (1874), followed by a nude throned Juno (1877); a marble statue of 'Painting' (1890); 'William Tell,' now in Lausanne; monuments to Thiers, Meissonnier (in front of the Louvre), and Jules Ferry, and 'Napoleon' on the Vendôme Column. He painted a Venus, now in the Luxembourg. In 1891 he was elected an Academician.

MERCIER, Desiré Joseph, Belgian cardinal, archbishop of Malines and primate of Belgium: b. 21 Nov. 1851 at Braine-l'Alleud, province of Brabant. Educated at Louvain, Paris and Leipzig, he was ordained priest in 1874 and became professor of philosophy at the University of Louvain. Here he organized the Institute Supérieure de Philosophie, based on the teaching of Saint Thomas Aquinas and founded under the auspices of Pope Leo XIII. As a distinguished lecturer Professor Mercier —as he then was— earned a high reputation for literary and scientific abilities, united with



HIS EMINENCE CARDINAL DESIRÉ MERCIER

Archbishop of Malines, Belgium

zeal, leadership and exalted purpose. He wrote several volumes of note, e.g., 'Les Origines de la Psychologie Contemporaine' (1897), 'Métaphysique Générale' and 'Critériologie,' which passed through numerous editions, as well as others of a less didactic character. He was also the founder of the *Revue Neo-Scholastique* when officiating as head of the school of neo-scholastic philosophy. On 8 Feb. 1906 it was announced that "Dr. Mercier, president of the Institute of Advanced Philosophy at Louvain," had been appointed archbishop of Malines. Though at first a general surprise, the appropriateness of selecting him to the episcopal bench soon became apparent. With energy and amiability he devoted himself to the administration of his diocese, and on 15 April 1907 was created and proclaimed cardinal and primate of Belgium. The German conquest of Belgium in the early stages of the European War brought him into world-wide prominence by the fearless and determined attitude he adopted toward the ravagers of his country. In the papal conclave of September 1914, after the death of Pope Pius X, a number of the assembled cardinals decided to give Mercier their vote in the election for a new pope as a demonstration of sympathy with Catholic Belgium. He was supported by the French and English cardinals, while the Germans and Austrians protested against what they called undue interference of politics in the highest spiritual functions of the Church, and Cardinal Della Chiesa was ultimately elected. Cardinal Mercier arrived in London 12 Sept. 1914, and on the following day (Sunday), accompanied by the late Duke of Norfolk, was received in audience by the king and queen. In the afternoon he witnessed a remarkable and enthusiastic demonstration in Westminster, organized by Irish members of Parliament and attended by many thousands of people. He returned to Belgium the same night and exerted himself during the long period of the German occupation to ameliorate the sufferings of his compatriots. He came into frequent collision with the German authorities, notably von Bissing (q.v.). The cardinal's pastoral letters, collected and published by Burns and Oates (London 1918), form a series of earnest exhortations to the practice of Christian fortitude and hope amid the horrors and afflictions of war.

MERCIER, Honoré, Canadian lawyer, journalist and politician: b. Iberville, Quebec, 15 Oct. 1840; d. Montreal, 30 Oct. 1894. He was educated at Saint Mary's (Jesuit) College in Montreal and afterward studied law at Saint Hyacinthe, being admitted to the bar in 1865. During his legal studies (1862–64) he was editor of the *Courier de Saint Hyacinthe,* the Conservative organ of the district; but as a journalist he was among those who opposed Canadian Confederation. This led him to abandon his editorship and to sever his connection with the Conservative party. During the years immediately following the confederation of 1867 Mercier devoted himself to his profession, but in 1871 he reappeared in politics as the leader of the National party (also called the Parti noir), whose leading aim was to curtail the power of the Dominion government in favor of provincial rights. On this platform he was elected to the federal Parliament for Rouville in 1872, but did not stand for re-election to the Parliament of 1873. After some four years devoted to the successful practice of law at Saint Hyacinthe, Mercier was elected (1879) to the legislative assembly of Quebec, being appointed solicitor-general of the province in the ministry of M. Joly. On the defeat of the Joly administration in the same year, Mercier passed into the opposition, of which he presently became leader. In 1881 he left Saint Hyacinthe to practise law in Montreal. In 1885 the French Canadian population was thrown into a ferment by the trial and execution of Louis Riel, the leader of the North West Rebellion (q.v.). Mercier, heading the agitation thus occasioned, declared Riel to have been a "victim of the fanaticism of Sir John A. Macdonald." On the strength of the feeling thus aroused, the Conservative party was defeated in the provincial elections of 1886 and Mercier found himself at the head of the administration. In this capacity he carried through the legislature the famous Jesuit Estates Act, a measure intended to compensate the Jesuits for the property confiscated by the Crown at the time of the papal dissolution of the order. In spite of the agitation throughout Canada against the act the Mercier government was upheld in the election of 1890. In the same year grave charges of peculation were brought against the Premier and his colleagues on the ground that a subsidy of $100,000, intended for the Baie des Chaleurs Railway, had been diverted to political uses. Investigation resulted in the dismissal of the ministry (15 Dec. 1891), action which was ratified by the overwhelming defeat of the Mercier party in the election which ensued. The criminal charges brought against Mercier, as a result of this and a second official investigation, ended in a verdict of not guilty. Mercier remained a member of the assembly but with diminished influence and shattered health.

MERCUR, mėr'kėr, **James,** American soldier: b. Towanda, Pa., 25 Nov. 1842; d. West Point, N. Y., 22 April 1896. He was graduated from West Point in 1866 and commissioned in the engineering corps. He was engaged in surveys made under the government and in 1867–72 was assistant professor of natural and experimental philosophy at West Point, after which he was in command of an engineering corps and in 1876–81 assisted in clearing the New York harbor of the obstructions at Hell Gate. He was professor of civil and military engineering at West Point from 1884 until his death. He published a revised edition of Mahan's 'Permanent Fortification' (1887) and the original works, 'Elements of the Art of War' (1888); and 'Military Mines, Blasting and Demolitions' (1892).

MERCURIC CHLORIDE. See CORROSIVE SUBLIMATE.

MERCURIC CYANIDE. See HYDROCYANIC ACID.

MERCURY, mėr'kū-ri, the Roman god Mercurius who presided over commerce and gain. See HERMES.

MERCURY, the planet of the solar system which is nearest to the sun. Owing to the position of its orbit, far inside of that of the earth, it is never seen by us at any great distance from the sun, but seems to swing back and forth, first on one side of the central lumi-

nary and then to the other. (See SOLAR SYSTEM). Its time of revolution is a little less than three months and therefore less than one-fourth that of the earth. When, starting from a point between the earth and the sun, it has completed a revolution, the earth has moved forward in its orbit, and, in consequence, nearly 30 days more are required to catch up with the earth and again come into conjunction with it. Consequently the time of one synodic or apparent revolution is nearly four months. It follows that its greatest elongations from the sun occur at intervals of nearly 60 days, alternately to the east and to the west. When near its greatest eastern elongations it may be seen in the west toward the close of twilight. When west of the sun it may be seen in the morning before daybreak. To the naked eye it seems to shine as a star of the first magnitude. But as it is never seen in a perfectly dark sky except when very near the horizon, it is not readily observable in high northern latitudes. It is said, in fact, that Copernicus died without ever seeing this planet.

With the aid of a telescope, Mercury may be seen the greater part of the time — in the afternoon when it is east of the sun; in the morning when it is west of it. But it is never seen fully illuminated unless near the farther part of its orbit, beyond the sun, when it may be lost in the effulgence of the sun's rays. When it approaches nearest to us, only a small portion of the hemisphere presented to us is illuminated. Owing to these unfavorable conditions observations on it are extremely difficult, and it cannot be said that anything is certainly known of its physical constitution. The difficulty is increased by its being much the smallest of all the major planets. The result is that nothing is positively known as to the time of the rotation on its axis. About 1800, Schroeter, a celebrated observer of the planets, thought it rotated in a little more than 24 hours. But Herschel found no foundation for this belief, and could see no evidence whatever of a rotation. About 1889 Schiaparelli, the celebrated Italian astronomer, making a very careful study of the planet, under the favoring sky of Milan, was led to the conclusion that, like the moon, Mercury's time of rotation was the same as its time of revolution in its orbit, so that it always presented the same face to the sun. A similar conclusion was reached by Lowell at the Flagstaff Observatory. But the difficulty of seeing any well-defined features on the planet is such that conservative astronomers are still in doubt on the subject, and regard the time of rotation as still unknown and not likely soon to be determined.

The most remarkable feature presented by the motion of Mercury is that the perihelion of its orbit is found to move forward considerably faster than it ought to by virtue of the attraction of the known bodies of the solar system. The cause of this motion has perplexed astronomers for half a century; it was at first supposed by Leverrier to be due to the attraction of one or more unknown planets between Mercury and the sun. Another explanation was sought in the assumption that the sun's gravitation diminishes somewhat more rapidly than it would according to the law of the inverse square. If this were so, the perihelion of all the other planets ought to be effected by a similar motion, and in particular there should result disturbances in the motion of our moon which, now that the extremely abstruse mathematical theory of that body (based upon the law of gravitation), has been so perfected, it is certain do not exist. Similar discrepancies have been detected in the motions of some of the other planets, notably in the node of Venus and in the perihelion of Mars. When the disturbing pull of the exceedingly tenuous, lens-shaped cloud of particles known as the Zodiacal Light is computed and allowed for, it is found that not only these, but also the historic discrepancy in the motion of the perihelion of Mercury, disappear. It is very probable that the true explanation of them is to be found in this source.

At varying intervals the motion of Mercury in its orbit causes the planet to pass between the earth and the sun; it is then seen as an intensely black, round dot crossing the sun's disc. The next four transits will occur on 7 May 1924, 8 Nov. 1927, 10 May 1937 and 12 Nov. 1940. None of these will be visible, however, from the United States. The first transit which will be completely visible here will occur on 13 Nov. 1953 and 6 Nov. 1960. But little use is made of transits of Mercury. Attempts have been made to detect traces of an atmospheric ring about the planet during the transit, as may be done during a transit of Venus (q.v.), but these have not been certainly successful. Newcomb subjected 21 transits from 1677 to 1881 to a critical discussion to ascertain whether there might be found from them any indication that the time of rotation of the earth on its axis,— the unit of time throughout astronomy,— had changed during this interval. There was found no conclusive evidence in any appreciable change in the length of the day. It has certainly not increased or diminished by so much as 0.01 second in the course of the past 2,000 years.

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MERCURY, Fulminate of. See FULMINATES.

MERCURY, or **MARKERY,** a perennial herb (*Chenopodium bonus-henricus*) of the natural order *Chenopodiaceæ*. Like other members of its genus, it has mealy foliage and inconspicuous greenish flowers. The tender shoots which appear in early spring are valued as a substitute for spinach, for which purpose the plant is frequently cultivated. In Europe it is better known as Good King Henry. It will grow in any garden soil with practically no attention.

MERCURY, Medical Uses of. Mercury uncombined is used only for its bulk. As it is without medicinal effect, at one time as much as two pounds of uncombined mercury would be given for the purpose of mechanically dislodging some obstruction in the intestines. Triturated with some other substance it is valuable medicinally and produces specific mercurial effects, local and constitutional. Such compounds are "blue mass" (blue pill), mercury with chalk (gray powder), mercurial ointment and mercurial plaster. All mercurial compounds entering the circulation have a peculiar influence

over nutrition. This is especially true of salts of mercury, such as mercurous chloride or calomel, mercuric chloride or corrosive sublimate and mercurous iodide or the green iodide of mercury. In small doses, especially in syphilis, mercury has a definite toxic action on the spirochete which is the known parasite which causes syphilis. In large doses mercury acts as a corrosive poison and tends to inflame the mucous membrane of the mouth, stomach and intestines. Calomel and blue pill are largely used for their laxative effects. Mercury in the various forms of powder, ointment, lotion and plaster is used to remove body-vermin, relieve itching and as a remedy in certain skin affections. Mercuric chloride, known as corrosive sublimate, is a powerful antiseptic and is taken internally in very minute doses. See TOXICOLOGY.

MERCURY, or QUICKSILVER, a metallic element which has been known for many centuries and which is distinguished from the other metallic elements by the fact that it is liquid at ordinary temperatures. Mercury occurs native in the metallic form, but by far the larger part of it is obtained by distilling the native sulphide, cinnabar (HgS), in a current of air which is regulated so as to burn the sulphur of the sulphide, while leaving the mercury in the metallic state. Cinnabar occurs abundantly at Idria, Austria, at Almaden, Spain, and at New Almaden, near San Francisco Bay, and it is from these sources that the mercury of commerce is chiefly obtained. It occurs as veins and disseminated deposits, the ores of which are believed to have been introduced by hot waters of magmatic (q.v.) origin. Spain is the largest producer and the chief output in the United States comes from California, though deposits are known in Texas and Oregon. Mercury freezes at 37.9° F. below zero and boils, at the ordinary atmospheric pressure (760 mm.), at 675° F. Its specific gravity at 32° F., when compared with water at 39° F., is 13.596. Its specific heat at ordinary temperatures is about 0.0331, and its average coefficient of expansion between 32° F. and 212° F. is 0.00010085 (Fahrenheit scale). The ratio of the specific heat of the vapor at constant pressure to its specific heat at constant volume has been found, experimentally, to be 1.666, which indicates that the molecules of the vapor are monatomic and that they behave, so far as their collisions among themselves are concerned, as though they were elastic spheres. (See GASES, KINETIC THEORY OF). Mercury may be freed from dust and dirt by filtering it through leather. To remove tin, lead and other dissolved metals, the mercury may be left for some weeks in contact with concentrated sulphuric acid and subsequently digested with dilute nitric acid; or it may be several times distilled. Various other modes of purification are also known.

The metal is chiefly used, in the arts, for the extraction of gold from crushed ore or fine gravel, the ore being washed by a gentle stream of water over a copper plate which is amalgamated with mercury. The gold particles, being heavy, sink through the water so as to come into contact with the copper plate, where they are held by the mercury in the form of a gold amalgam. (See GOLD and AMALGAM). In physics, mercury is also greatly used for filling thermometers and barometers, and for many other purposes. It is likewise used in medicine, both in the metallic form and in its compounds with other elements. Metallic mercury, when rubbed up in a mortar with confection of roses until its globules are so fine as to be indistinguishable to the eye, is known as "blue mass" and is administered in the form of pills, as a cholagogue.

Mercury has the chemical symbol Hg (from "hydrargyrum," its Latin name), and an atomic weight of 200.3 if O = 16, or 198.8 if H = 1. It forms two oxides, each of which give rise to a series of stable salts. The metal does not oxidize upon exposure to air at ordinary temperatures, but when heated nearly to its boiling point in air or in oxygen it slowly oxidizes, with the formation of mercury monoxide (or mercuric oxide), HgO. When prepared in this manner the monoxide is crystalline and red, and for this reason it is familiarly known as the "red oxide." The same substance may be prepared in an allotropic form by precipitating a solution of mercuric nitrate by the addition of caustic potash, the monoxide then coming down as an amorphous yellow powder. The red oxide turns black when strongly heated, but recovers its color upon cooling. When heated to redness the monoxide decomposes into metallic mercury and free oxygen. It can, therefore, be used as a source of oxygen; and it was in fact by heating this substance that oxygen was first discovered by Priestley. By acting upon the red oxide or upon metallic mercury by excess of nitric acid, mercuric nitrate, $Hg(NO_3)_2$, is formed; while if nitric acid is allowed to act upon excess of mercury, mercurous nitrate, $HgNO_3$, is obtained. The corresponding sulphates of the metal are obtained by acting upon metallic mercury with sulphuric acid, mercuric sulphate ($HgSO_4$) or mercurous sulphate (Hg_2SO_4) being obtained, according to the conditions of the experiment. Mercuric sulphide, HgS, which occurs native as the mineral cinnabar, and which is also known as vermilion, is bright red in color and may be prepared artificially by heating mercury with sulphur, or by passing sulphuretted hydrogen gas through a solution of mercuric salt. When obtained in the latter way it comes down as a black amorphous powder, which may be brought into the normal red crystalline form by sublimation. Mercury forms two chlorides which are extensively used, especially in medicine. Mercuric chloride (also known as "bichloride of mercury" or "corrosive sublimate"), $HgCl_2$, is prepared by heating a mixture of equal parts of mercuric sulphate, $HgSO_4$, and common salt, NaCl; the reaction being $HgSO_4 + 2NaCl = HgCl_2 + Na_2SO_4$. The bichloride is fairly soluble in water and dissolves readily in a solution of sal ammoniac. It is also quite soluble in alcohol. It crystallizes in the trimetric system, melts at 509° F. and boils at 563° F. It is intensely poisonous and is one of the most powerful germicides known. It is used in surgery and medicine as an antiseptic and disinfectant, and is occasionally administered internally in very small doses. Mercurous chloride, HgCl (more familiarly known as "calomel," or as the "mild chloride"), is a white powder, insoluble in water and is greatly used in medicine, both as a cholagogue and otherwise. It may be prepared in various ways, but the usual method is

by heating four parts of corrosive sublimate with three parts of metallic mercury; the mercury combining with half of the chlorine of the corrosive sublimate, as indicated by the equation $HgCl_2 + Hg = 2HgCl$. The calomel sublimes and must then be ground to a fine powder and thoroughly washed, in order to remove any free soluble corrosive sublimate that may not have been decomposed. The so-called "white precipitate," which is obtained when ammonia is added to a solution of corrosive sublimate, has the composition NH_2HgCl. Mercurous oxide, or "black oxide of mercury," Hg_2O, may be obtained as a black powder by digesting calomel with excess of caustic potash. It decomposes into the red oxide and metallic mercury upon exposure to light, or upon being heated to the boiling point of water. Many other compounds of mercury are known, but they are of less importance than the ones here given.

MERCURY VAPOR LAMP. See VAPOR MERCURY LAMP, THE HEWITT.

MERCY, Fathers of, Roman Catholic religious congregation founded on the restoration of Louis XVIII, 1814, and approved of by the Pope (1834) under the title 'Society of the Priests of Mercy.' The object of the society is the conversion of sinners by mission preaching and the practice of the corporal works of mercy. In 1839 the order founded houses in New York and Saint Augustine, Fla., and the fathers have churches for the French population in Brooklyn and Manhattan. The mother house was originally at Paris, but was removed to Rome in 1903 as a result of the Association Law. Consult Delaporte, 'Vie de Jean-Baptiste Rauzan' (1857).

MERCY, Sisters of, a name given to members of several religious communities founded for the purpose of nursing the sick at their own homes, visiting prisoners, attending lying-in-hospitals, superintending the education of females and the performance of similar works of charity and mercy. Communities of Sisters of Mercy are now widely distributed over Europe and America. There are also religious orders under the same name connected with the Anglican Church. The term is applied more specifically to the Order of Our Lady of Mercy, a Roman Catholic order founded for the objects above enumerated in Dublin 1827. The first house in America was established in Pittsburgh, Pa., 1843, and from it have sprung 65 convents. Consult 'Leaves from the Annals of the Sisters of Mercy' (1881). See MCAULEY, CATHERINE.

MERCY-SEAT (Heb. *Kappo'reth,* covering or lid, that is, of the sacred ark in the ancient Jewish tabernacle), an unfortunate and inappropriate term as applied to the cover of the chest or ark containing the two tables of the law and overspread by the wings of the Cherubim. Between these wings appeared the Shekinah or fiery symbol of the divine presence hovering over the mercy-seat, which consisted most probably of a sheet of the finest gold (Ex. xxv, 17, etc.; xxx, 6; xxxi, 7, etc.). The New Testament writers seem to hold that the term contains by implication the idea of the propitiation (q.v.) (Heb. ix, 5; Rom. iii, 24). The high priest sprinkled on it the blood of the yearly atonement, and some writers think that the term covering as applied to it refers more to the covering of or atonement for sins than to its use in covering the treasures of the ark. In any case the idea of a seat, as if the expression in Psalms xcix, 1, "he sitteth between the cherubims" referred to the earthly tabernacle is inappropriate. Consult Pratenias, 'De Judæa Arca' (1727); Werner, 'De Propitiatorio' (1695). See SHEKINAH.

MEREDITH, George, English poet and novelist: b. Hampshire, 12 Feb. 1828; d. London, 18 May 1909. Details of Meredith's life are meagre; little is known of his parentage or of his education except that he was sent to school in Germany and later studied law, which he gave up for literature. For a time he was a pupil of T. L. Peacock (q.v.), whose daughter became his first wife. His residence was for some years at Box Hill in Surrey.

His first work in literature was a volume of poems published in 1851. This was followed in 1856, by 'The Shaving of Shagpat,' a brilliant fantastic Oriental tale in which some interpreters have professed to see a political satire. In 'The Ordeal of Richard Feverel' (1859) however, he began the course of studies in human temperament which have made his name famous. The novel, unquestionably one of the most powerful in the language, deals with the ordeal of adjustment to the world of a high-spirited youth; it is the conflict between temperament and desire, represented in the hero and a variety of conventions, most rigidly typified in the "system" of his father, Sir Austin Feverel. The effect of the book is chiefly tragic. 'Evan Harrington' (1861), the next novel, is wholly comic in idea; the characters are embodiments of various "humors," most strikingly represented in the intriguing Countess; the plot, as in all of Meredith's novels, is quite secondary in interest and springs from the characters. 'Modern Love,' a sequence of brilliantly phrased, intricate, 16-lined sonnets was published in 1861. 'Emilia in England,' now called 'Sandra Belloni,' appeared in 1864 and its sequel 'Vittoria' three years later. The story is that of a young Italian girl of unaffected manners and character and her life among people of very diverse temperaments and social ideas; the theme of the novel may be regarded as the conflict, among very real people, of the genuine with the sentimental character. Between the two novels appeared in 1865, 'Rhoda Fleming,' perhaps the simplest of all Meredith's novels in style and a powerful study in character. It deals, on the whole, with a conventionally more humble order of society than is usually found in Meredith's novels, and is rather more direct, but few things in fiction are more impressive than the almost instinctive steadfastness of the heroine or more gloomy than the spiritual confusion that she tries to set in order. In 'The Adventures of Harry Richmond' the note is again chiefly comic. Much of Meredith's best work lies in the freshness of the varied scenes of this book and in the hero's father is perhaps as typical a character of the novelist as can be found, a man whose adventurous fancy and devotion to his son "informs" numberless odd and extravagant acts. Another excellent study of a different sort is 'Beauchamp's Career' (1876). It is the analytical, yet lively, story of a young man whose earnestness of character and whose activity caused him, from a conventional point of

view, to fail in life. Like other of Meredith's novels it is a great contribution to our understanding of the varieties of human temperament and to our sympathy with them.

In 'Beauchamp's Career' perhaps more than in any of his preceding novels Meredith directly explained his aim in drawing character; it was to present a type of motive and to show how it dominates and gives unity to a series of acts. The motive which causes action is, so to speak, temperamental rather than deliberate; in typical examples like the Countess in 'Evan Harrington,' or Beauchamp, for instance, Meredith is interested in the expression of temperament rather than a story. The Countess, on the face of the matter, wished for the social advancement of her family; what she really wanted was scheming for the sake of scheming and her social ambitions were but the medium of expression. This manner of approaching character, indeed, dominated all the character drawing in Meredith's novels, but it was not expressed as a deliberate theory until the publication, in 1877, of 'On the Idea of Comedy and the Uses of the Comic Spirit.' The essence of this essay is that comedy is one of the most wholesome and effectual ways of probing and purifying the ills of the world, that good comedy, as in the plays of Molière, really enables the reader to recognize what is genuine and discard what is sentimental; unfortunately, instead of good comedy we often are treated, in most literature, to painful moralizings. Meredith's fullest and finest expression of this idea is in his 'The Egoist' (1879), unquestionably his masterpiece and one of the chief glories of English fiction. Egoism, that love of self which prevents men from seeing things in their true relations, is one of the fundamental failings of mankind and Meredith has drawn it, in the inimitable Sir Willoughby Patterne, as a figure of colossal proportions. The novelist's skill and dispassionateness as an artist was never better shown than in the fact that he refuses to give conventional rewards and punishments; for the hero's unfailing egoism permits him in the end to turn to the flattering of his vanity what would ordinarily be regarded as humiliation.

Pursuing his end, an analysis and a synthesis of the springs which govern action, Meredith in his next novel, 'The Tragic Comedians' (1880) took a story from contemporary European court life and explained it as a piece of dramatic psychology. The comparative shortness of the novel makes it a good study of the author's method. This novel, too, indicated a tendency on his part to depict the motives and the psychology of people actually in existence rather than, as in 'The Egoist' and its predecessors, to draw the embodiment of a type of "humor." This tendency was certainly evident in his next novel, 'Diana of the Crossways' (1885), his greatest popular success, and is shown in the fact that certain of the incidents and characters excited curiosity as, to their originals. It is manifest also in his last three books, 'One of Our Conquerors' (1890), 'Lord Ormont and His Aminta' (1894) and 'The Amazing Marriage' (1895), which are perhaps less broadly representative and more particular than his earlier novels. Meredith's writings also include four short stories, 'The Tale of Chloe,' 'The House on the Beach,' 'Farina' and 'The Case of General Ople and Lady Camper.'

Meredith, who was one of the last great novelists to hold over, as it were, from the age of Victorian literature, belongs to the so-called psychological school, of which the great popular representative is George Eliot, with whom he is practically contemporary. He differs from her in several important respects: The comedy of character (as the term is understood with Cervantes and Molière) as well as the tragic side of life, is reflected in his pages. His attitude is detached and impersonal and he never allows his sympathies to intrude upon his study of the type he is treating, a characteristic which accounts for the criticism sometimes made that he lacks temperament and which is doubtless one of the reasons for his comparative unpopularity. He is more interested in his characters as types of temperament than as individuals, and in this field he has perhaps represented the greatest range and variety of human motive that is to be found in English fiction. Taking strata of society, on the whole, conventionally above those treated by George Eliot, he has made them representative of a great variety of "comic" motives. As a moralist, his attack has been upon those types which are broadly termed sentimental, and in this respect his pictures of such men as Wilfred Pole and Willoughby Patterne are inimitable. The person that he most approves is the simple, considerate, intelligent being, well represented in such minor heroes as Merthyr Powys, Vernon Whitford, Dartrey Fennellan and Tom Redworth, and pictured to the height of brilliancy in his real heroines. In no other novelist, in no English writer except Shakespeare, can be found so splendid a galaxy of women: Rose Jocelyn, Janet Ilchester, Renée, Cecilia Hilkett, Jenny Denham, Clara Middleton, Emilia, Carinthia Jane and many others, as well as such older ladies as Lady Jocelyn and Lady Charlotte Eglett, are the best tribute to womankind that English literature possesses, and the creation of them is an achievement of the very first rank. His style is frequently criticized as involved and epigrammatic, but no novel contains passages of greater poetical charm. See DIANA OF THE CROSSWAYS; EGOIST, THE; MODERN LOVE; ORDEAL OF RICHARD FEVEREL, THE.

Bibliography.—The best complete American edition of the poems and novels is by Messrs. Scribner, in 16 volumes. Commentary is scattering and appears chiefly in the form of contemporary reviews. Consult Brownell, 'Victorian Prose Masters' (1901); Lynch, Hannah, 'George Meredith' (1891); and, for a varied symposium, LeGallienne, 'George Meredith, Some Characteristics; with a Bibliography by John Lane'; and for his place in the history of the novel, Cross, 'The Development of the English Novel' (1899). Consult also Ellis, S. M., 'George Meredith: His Life and Friends' (London 1919).

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MEREDITH, Louisa Anne Twamly, Australian author and artist: b. Birmingham, England, 20 July 1812; d. Hobart Town, Tasmania, 21 Oct. 1895. She had already published a volume of verse (1835); and 'The Romance of Nature,' illustrated by herself (1836), before

she married her cousin Charles Meredith (1839) and removed to Australia, whence they went to Tasmania five years later. She continued her literary activity till the end of her long life and for many years before her death had been the most prominent Tasmanian author. Among her books, many illustrated by herself, are 'My Home in Tasmania' (1852); 'Over the Straits' (1860); 'Tasmania: Friends and Foes, Feathered and Furred' (1880). Her prose works were popular in Australia and had also a circulation in England and this country; and her verse, of which she published several collections, was at once pleasing and unpretentious.

MEREDITH, Owen, the pseudonym of Bulwer-Lytton. See LYTTON, EDWARD ROBERT BULWER.

MEREDITH, Samuel, American patriot and first Treasurer of the United States: b. Philadelphia, Pa., 1740; d. 10 March 1817. His father was a Welshman and a friend of George Washington. Meredith became a member of the Pennsylvania colonial legislature, and when the American Revolution broke out he entered the Colonial army as major, took part in several battles and was made brigadier-general for gallant services. He gave £10,000 in silver for carrying on the war, and was exiled from Philadelphia when the British occupied it. Meredith served in Congress in 1787–88 and in 1789 became the first Treasurer of the United States, advancing to the government, on taking the office, $20,000 and later $120,000, for which he was never reimbursed. He remained in the office of Treasurer until 1801.

MEREDITH, SIR William Ralph, Canadian jurist: b. Westminster, Ontario, 31 March 1840. He was educated in the University of Toronto and was admitted to the bar in 1861, when he established a law practice in London, Ontario. He became queen's counsel in 1876 and in 1881 removed to Toronto. In 1872 he entered the provincial legislature of Ontario as member for London, and for 16 years he was leader of the Conservative opposition during the long reign of Mowat as Premier. In that position he showed a disposition to subordinate provincial rights to those of the Dominion; and he was an advocate of manhood suffrage, secret ballot, the enlargement of powers to municipalities and workmen's compensation. In 1894 he was appointed chief justice of the Court of Common Pleas and in 1912 chief justice of Ontario. In 1896 he was appointed a commissioner for the revision of the provincial statutes, and in 1905 he was one of the commission that investigated the affairs of Toronto. He was knighted in 1896, and has been chancellor of the University of Toronto since 1900.

MEREZHKOVSKI, Dmitri Sergeyevich, Russian critic and novelist: b. Saint Petersburg, 1865. He was educated in his native city and published his first volume of verse at the age of 23. In 1893 he published an essay on the decadence of Russian literature which attracted general attention. In 1901–02 appeared his 'Critical Studies of Tolstoy and Dostoyevsky as Men and as Artists' and 'The Religion of Tolstoy and Dostoyevsky,' which proved him a critic of high order. Next there appeared his trilogy of historical novels dealing with the perennial conflict between Christianity and paganism. Collectively known as 'Christ and Antichrist,' this work has appeared in many modern languages. It includes 'Smert Bogov' (Eng. trans., 'The Death of the Gods,' London 1901), in which the chief character is Julian the Apostate; 'Voskresenie Bogi' (Eng. trans., 'The Forerunner,' ib. 1902) with Leonardo da Vinci as chief character; and 'Antikhrist: Petr i Aleksyey' (Eng. trans., 'Peter and Alexis,' London 1905). He also wrote the dramas 'Paul I' (1908) and 'Alexander I' (2 vols., 1913). Consult collected edition of his works (15 vols., Saint Petersburg 1911–12) and Phelps, W. L., 'Contemporary Russian Novelists' (Boston 1913).

MERGANSER, or **FISH-DUCK,** a duck of the genus *Mergus,* distinguished by its slender cylindrical bill, the upper mandible terminating in a strong hooked "nail," and its margins presenting the appearance of rows of tooth-like processes. The most widely distributed is the red-breasted (*Mergus serrator*) known as sheldrake in America where it is less numerous than in the Old World. The goosander (*M. merganser*) and the numerous smew (*M. albellus*) are familiar European and Asiatic species, while the hooded merganser (*Lophodytes cucullatus*) or sawbill is familiar in North America. The mergansers feed chiefly upon fishes and swim and dive after their prey with great ease and dexterity. They are essentially northern in their distribution, breed in the far north and migrate southward on the approach of the colder season. The nest is built of grass and roots and is lined with down. It is usually placed in a hollow of the bank near water, but some species prefer the greater security of a hollow tree. The flesh is coarse and rank. Eight or 10 species are known in various parts of the world. The female alone incubates, but the male watches near the nest. From 8 to 14 eggs are laid and the young enter the water as soon as they are hatched.

MERGENTHALER, mĕr'gan-tā-lèr, **Ottmar,** American inventor: b. Würtemberg, Germany, 10 May 1854; d. Baltimore, 28 Oct. 1899. He was a watchmaker by trade; came to the United States at 18, entered the employ of the United States government at Washington where he kept clocks and electrical devices throughout government buildings in order; improved apparatus used in the signal service, and in 1876 removed to Baltimore, where he devoted himself to perfecting a type-setting machine. On this he spent several years, his scheme going through four stages, the last of which was the linotype (q.v.). When he had patented this machine he had much difficulty in introducing it. It was perfected by the addition of the Rogers spacer and numerous minor inventions by Philip T. Dodge and others, brought its inventor large profits and is now in very common use in large printing establishments. Mergenthaler also invented a machine for making fruit gift-baskets of veneered wood.

MERGER, *in law,* the sinking or obliteration in conveyancing of lesser estates or property into greater ones, or the consolidation of two or more estates; a term used in financial or business circles, meaning the consolidation or combination of a particular class of manufactories, railroads or other business interests

generally in the nature of a trust. Late in the 19th century it became common in the United States for a group of corporations, which it was desired to bring together for monopolizing an industry, to "merge" by forming a holding company, which took over the majority stock of each subsidiary company in the merger and gave in exchange the stock of the holding company. To test the validity of such mergers a suit was brought against the Northern Securities Company, and after exhaustive arguments and much delay the United States Supreme Court declared that the procedure was "in restraint of trade." Since then corporation mergers have ceased. The principle still holds good, however, in both civil and criminal law, that the lesser may merge into the greater. In contracts the acceptance of a high grade of security is held to extinguish the lower grade. When a bond is given for the performance of a contract the obligation to fulfil the contract is merged in the bond as the higher obligation. See TRUSTS.

MERGUI (mĕr-gē') **ARCHIPELAGO,** a chain of islands in the Bay of Bengal, off the coast of Tenasserim in Burma, the more northern ones forming a part of the British district of Mergui; area, 10,000 square miles. They are generally covered with trees and present many picturesque features, rising at some points to the height of 3,000 feet. The largest island is Kings Island, some 25 miles long. Some tin is found here. The chief town is Mergui, with a population of about 15,000. The locality is one of the dampest on the globe, the rainfall exceeding 100 inches annually. The inhabitants belong to a race called Selungo. They give little attention to agriculture, obtaining a sustenance mainly by fishing, pearl gathering and selling edible birds' nests. The Selungs are peaceful and industrious, but few in number. The adjoining seas abound in fish and excellent oysters; pearls of good quality are found. Pop. about 115,000.

MERIDA, Mexico, the capital city of Yucatan. The city was founded in 1542 and is situated on a plain. There are railway connections with all important points in the interior and several lines of steamers ply between its port, Progreso, 25 miles distant, and Vera Cruz, New York and other prominent commercial ports. The surrounding country is almost entirely devoted to the sisal hemp industry, which has reached enormous proportions in the state. Hides, sugar, chicle and indigo are also exported. There are manufactories of cotton goods, cigars, panama hats, leather, soap, etc. The principal buildings are the government palace, the municipal palace, the Casa del Conquistador Montejo (the first Spanish house built in the city), the old cathedral, the School of Arts, the Penitentiary, Literary Institute or State College, Normal School for Teachers, Meteorological and Astronomical Observatory, Yucatan Museum, Catholic College of San Ildefonso, schools of medicine, surgery, pharmacy, jurisprudence and notarial instruction, the Literary Institute for Girls, the College for Girls, the Catholic School for Girls, the Tereseano College, the Primary School of Arts and Works and the Institucion de Beneficiencia Privado, founded by Leandro L. Ayala at an outlay of $1,000,000. There are an asylum for maniacs, a lazareto, a maternity hospital, three other hospitals, an asylum for mendigos, two theatres and an arena for bull fights. The Hidalgo Park contains a statue of Gen. Cepeda Peraza, and one symbolizing the peace of the state. Near the great cathedral are also large statues of Saint Peter and Saint Paul. A body of public security, a jefe politico and an inspector-general preserve order and ensure safety to all. The streets are paved with asphalt. Merida contains two local financial institutions — the Banco Yucateca, with a capital of $8,000,000, and the Banco Mercantil de Yucatan, with a capital of $6,000,000, and a branch of the National Bank and an agency of the Bank of London and Mexico. Pop. about 50,000.

MERIDA, Spain (the Roman *Augusta Emerita*), a small decayed town of the province of Estremadura, on the Guadiana, 32 miles east of Badajoz. It is unique in Spain, and is in some points a rival of Rome itself on account of the number and magnitude of its remains of Roman antiquity. The Guadiana is here crossed by a Roman bridge of 64 arches (originally 81; 17 destroyed in 1812) and with a length of 2,575 feet and a breadth of 26 feet; it was erected by Trajan. There is another Roman bridge over the Albarregas, 450 feet long, 25 feet wide, still quite perfect, in spite of the traffic of 18 centuries since its erection. There are also remains of a castle built by the Romans, and among other most noteworthy monuments of antiquity are an old half-Roman, half-Moorish palace, the Casa de los Corvos, constructed out of a temple dedicated to Diana, several aqueducts, an ancient amphitheatre and a circus. Merida was founded in 23 B.C., and flourished in great splendor under Roman and Moor until 1228, when it was taken from the Moors, after which it began to decline. Pop. 7,390.

MERIDA, Venezuela, town, capital of the state of Los Andes, 5,290 feet above sea-level, 60 miles south of Lake Maracaibo, at the foot of the Sierra Nevada de Merida, which tower to a height of about 15,000 feet. It was founded in 1558 by Juan Rodriguez Saurez. It was almost wholly destroyed by an earthquake in 1812 and again seriously damaged in 1894. It is the seat of a bishop, contains a fine cathedral, one of the two national universities of Venezuela, and has several high schools. Its manufactures are carpets, woolen and cotton goods. Pop. about 15,000.

MERIDEN, Conn., city, in New Haven County, on branches of the New York, New Haven and Hartford Railroad, about midway between Hartford and New Haven. Originally the town of Meriden was a part of Wallingford until 1806, when the town of Meriden was incorporated. In 1867 it was granted a city charter. It is situated in an agricultural region, but the city is noted for its large number of manufactories. Some of the principal manufactures are cutlery, silver and plated ware, steel pens, hardware, machinery, screws, vises, glassware, cut glass, malleable iron, bronzes, firearms, brass castings, curtain fixtures, gas and kerosene fixtures, self-playing attachments for pianos and organs, woodenware, tinware, granite, agateware, lamp trimmings, etc. The shipments are principally manufactured arti-

cles, fruit, vegetables and tobacco. The educational institutions are the public and parish schools, a high school and the Curtis Memorial Library. It has the Curtis Home for Orphan Children and Aged Women, the Connecticut School for Boys and the Meriden Hospital. The government is administered under a charter of 1897. The mayor, who holds office two years, appoints fire and park commissioners, board of taxation and apportionment, police and board of public works. The council elects the health officer, board of compensation, tax collector, plumbing inspector, boiler inspector and fire marshal. The treasurer, sheriff, clerk and auditor are chosen by popular vote. Pop. 31,000.

MERIDIAN, Miss., city, county-seat of Lauderdale County, on Alabama and Vicksburg, Alabama Great Southern, Meridian and Memphis, Mobile and Ohio, New Orleans and Northeastern and Southern railroads. It is the largest city in Mississippi in population, manufactures and commerce, surrounded by fertile farm land of which cotton and vegetables are the chief agricultural products. Among numerous industrial establishments are lumber mills, fertilizer factories, cotton-seed-oil mills, cotton mills, cotton compresses and railroad shops. The annual wholesale trade is $20,000,000; the average annual bank clearings approximate $17,000,000. Meridian is the seat of the East Mississippi Female College (M. E.), founded in 1867 and opened in 1869, the Lincoln School (Congregational), the Meridian Academy (Methodist Episcopal South), both for colored students, a Catholic high school and Saint Aloysius Academy for Girls. Among prominent features are the municipal building, county courthouse, public library, Scottish Rite Cathedral, Stonewall Club, handsome churches and fine business and banking buildings. The Mississippi-Alabama Fair, held annually at Meridian, is the second largest agricultural and stock exhibition in the South in number of exhibits and attendance. Since 1912 the commission form of government is in operation; the city owns the waterworks and has a modern equipped and salaried fire department. Electric car service, electric and gas lighting are furnished by a company with a plant of sufficient capacity for a city of 100,000 inhabitants. During the Civil War, Meridian was devastated by General Sherman, 14–20 Feb. 1864, and in March 1906 a large portion of the city was destroyed by a tornado. Pop. 30,000.

MERIDIAN (Miss.), **Expedition to.** In January 1864 General Sherman concentrated two divisions of 10,000 each at Vicksburg under Generals McPherson and Hurlbut, and 3 February marched eastward with the purpose of destroying Meridian, 150 miles distant, as a railroad centre, and possibly penetrating to Selma, Ala., or, if the opposing forces did not seem too strong at Mobile, to turn southward from Meridian and attempt the capture of that city. Gen. Sooy Smith was to co-operate with a cavalry force from Memphis; General Dodge, in command at Pulaski, Tenn., was to hold Logan at Bellefonte, Ala., for a diversion toward Rome, Ga.; and General Thomas was to demonstrate toward Dalton to prevent troops being sent by General Johnston to Sherman's front. Sherman entered Jackson on the 6th, after heavy skirmishing with cavalry. Decatur was reached on the 12th. Meridian was taken the 14th, the Confederate force, under Gen. Leonidas Polk, being much less than Sherman's withdrawing toward Demopolis. The arsenal, extensive storehouses and cantonments were burned. The work of destroying the railroads centring at Meridian began on the 16th, 61 miles being rendered utterly useless to the north and east and 55 miles toward Mobile. This destruction was of the most systematic and thorough character; 10,000 men worked at it for five days; 61 bridges and culverts and more than a mile of trestles over swamps were burned; all rails were renderd useless. The object of the expedition was fully gained. Meridian was not wholly restored as a railroad centre during the war. Thereafter, the transporting of supplies eastward from the State of Mississippi was seriously interrupted for a long time and was greatly impeded up to the close of the war, while all military operations which required railroad facilities were rendered extremely difficult.

The expedition, however, was not as successful as had been hoped. The Confederates, by the exercise of great energy in the face of many difficulties, so strengthened Mobile as to forbid an advance in that direction. Sherman, not receiving the cavalry support under Gen. Sooy Smith which he had reason to expect from Memphis, was unable to push on to Selma, Ala., one of the great manufacturing cities and storehouses for military supplies of the Confederacy. Smith, in turn, had been unavoidably detained, and Sherman returned to Vicksburg, reaching its vicinity 26 February. His command had marched between 300 and 400 miles, had crossed Mississippi and inflicted well-nigh irreparable military damage; but had been prevented from carrying out his full program by Confederate activity in assembling forces in his extreme front.

MERIDIAN, one of the imaginary north and south lines on the surface of the earth that may be conceived of as passing through both poles and serving to indicate the longitude of places, and with a parallel of latitude mark their exact position. If one conceive the earth sliced into on one of these lines, the resulting surface is the plane of the meridian. There are also corresponding lines called astronomical or celestial meridian, which are imaginary circles of the celestial sphere passing through the poles of the heavens and the zenith of any place on the earth's surface. These correspond exactly to the geographical meridians, that is the celestial is exactly above the geographical meridian of any place. Every place on the globe has its meridian, and when the sun arrives at this line it is noon or midday, whence the name (Latin, *meridianus — medius,* middle and *dies,* day). (See LONGITUDE). The inconvenience arising from having a fixed meridian in different countries is sufficiently obvious, and geographers, navigators and astronomers have all found it frequently a source of confusion. After years of fruitless discussion the question of a reference or first meridian for the world came before an international conference held at Washington, 1 to 22 Oct. 1884. There, although the representatives of France and Brazil dissented, it was agreed to recommend

the meridian of Greenwich both as the astronomical and as the geographical reference meridian of the world, longitude to be reckoned east and west from this up to 180°. At the same time it was advised that the astronomical day should begin at midnight, mean Greenwich time, the hours for astronomical purposes being reckoned as before from 0 to 24. This arrangement began on 1 Jan. 1885. Previously many foreign map-makers had accepted the meridian of Greenwich as first meridian, Germans and Americans apparently having no jealousy of Great Britain in regard to the matter. The change of time has had some importance for astronomers, but ordinary civil time is still computed much as before. The zone system of reckoning standard time was adopted in the United States in 1883 and in Australia in 1895. In the former country there are four zones: the Eastern, taking time from the meridian of 75° W. (5 hrs. slow on Greenwich time); the Central, with standard meridian 90° W. (6 hrs. slow); the Mountain, 105° W. (7 hrs. slow); and the Pacific, 120° W. (8 hrs. slow). There are three Australian zones: Queensland, New South Wales, Victoria and Tasmania, with 150° E. (10 hrs. fast) as standard; South Australia, with 135° E. (9 hrs. fast); and Western Australia, with 120° E. (8 hrs. fast). Other standards adopted with reference to Greenwich are: 15° E. (1 hr. fast) for Mid-Europe; 22½° E. (1½ hrs. fast) for Cape Colony; 30° E. (2 hrs. fast) for Natal; 135° E. (9 hrs. fast) for Japan; and 172½° E. (11½ hrs. fast) for New Zealand. The meridian is also applied to the laying out of the earth, magnetism on a chart, north and south line cutting the magnetic pole, or the vertical plane formed by such line is a magnetic meridian. Consult any map for the meridian lines.

MERIDIAN CIRCLE, *in astronomy,* an instrument used in observatories to combine the functions of a transit instrument and of the old mural circle. It has a telescope mounted to turn in a circle, always in the plane of a meridian. Of course the axis must be accurately laid east and west, and for this purpose solid masonry piers are commonly provided. A vertical circle is carried on the axis of the transit instrument and revolves with it, its divisions being read by micrometer microscopes mounted solidly on one of the piers. In this way both coordinates of the position of a heavenly body, its right ascension and declination, are determined at the same meridian passage — a great saving of time over the old method with the instruments. See TELESCOPE.

MÉRIMÉE, mā-rē-mā, **Prosper,** French author: b. Paris, 28 Sept. 1803; d. Cannes, 23 Sept. 1870. He was educated at the Collège Henri IV and studied law though he never practised it. Under the pseudonym "Joseph Lestrange" he published in 1825 'Theatre de Clara Gozul, Comedienne Espagnole,' an assumed translation from the Spanish of eight prose comedies, but in reality his own work. From that time onward he continued to publish works at frequent intervals and at the same time had an official career of importance. Following the revolution of July 1830, he was made secretary to the ministers of commerce and marine, in 1831 was appointed inspector of ancient monuments, in 1844 became a member of the Academy, and senator of France in 1853. He was a commander of the Legion of Honor in 1860. Beside publishing several important works connected with his duties as inspector of ancient monuments he was the author of 'Colomba' (1840), a very popular novel of the Corsican vendetta; 'Carmen' (1847), a romance upon which the famous opera 'Carmen' by Bizet is founded; 'Lettres à une Inconnue,' his most famous work (1873); 'Lettres à une autre Inconnue' (1875); 'Lettres à Panizzi' (1881); 'Une Correspondance Inédite' (1896). The four works last named are Mérimée's most characteristic writings revealing him as a most loyal devoted friend. They differ widely from his other works, which though often brilliant are hard and unsympathetic, while these are tender and romantic. As a master of style Mérimée had few equals in his day. (See CARMEN; COLOMBA). Consult Filon, 'Mérimée et ses Amis' (1894); Haussonville, Mérimée (1888); Tourneux, 'Prosper Mérimée, ses Portraits, ses Dessins, etc.' (1879).

MERINO, a woolen or worsted fabric, introduced about 1826, and so named because made from the wool of merino sheep. The word is originally the title of an inspector of sheep pastures in Spain, and became attached to the short-wool Spanish sheep. The breed did not originate there, however, being imported from Africa by the Moors and bred by the Spanish. The wool was so highly regarded that they have been exported for breeding all over the world, but especially to Australia. See WOOL, MANUFACTURE OF.

MERINO SHEEP. See SHEEP.

MERIT, Order of, a British order instituted by King Edward VII, 26 June 1902, to confer distinction on persons in military, scientific, artistic and professional circles. The number is limited to 24. In 1917 there were 17 members, and three honorary members (four military).

MERIT SYSTEM, The. See CIVIL SERVICE REFORM.

MERIVALE, mĕr'i-vāl, **Charles,** English historian and ecclesiastic: b. Barton Place, Devonshire, 8 March 1808; d. Ely, 27 Dec. 1893. He was educated at Cambridge, took orders in the English Church, was rector of Lawford, Essex, 1848–69, and dean of Ely from 1869. He published 'The Fall of the Roman Republic' (1853), which forms the first part of his popular 'History of the Romans under the Empire' (latest ed., 1890); 'General History of Rome' (1875); 'Lectures on Early Church History' (1879); etc. Consult 'Autobiography and Letters' edited by his daughter (1899).

MERIVALE, Herman, English statesman and political economist; brother of Charles; b. Dawlish, Devonshire, 8 Nov. 1806; d. London, 9 Feb. 1874. He was educated at Oxford, where he was professor of political economy 1837–42. He was under-secretary for the colonies, 1848–59, becoming perpetual under-secretary for India in 1859. He wrote 'Colonization and Colonies' (1841), a much valued work; 'Historical Studies' (1865); 'Memoirs of Sir Philip Francis' (1867).

MERIVALE, Herman Charles, English author: b. London, 1839; d. 15 Jan. 1906. He

was educated at Harrow and Oxford, became a barrister of the Inner Temple in 1864 and edited the 'Annual Register' 1870–80. Among his publications are 'The White Pilgrim and Other Poems' (1875); 'The Cynic' (1882); several plays; 'The Whip Hand' (1884); 'The Dove' (1888). He was a son of J. H. Merivale.

MERIWETHER, Lee, American lawyer, social reformer and author; b. Columbus, Miss., 25 Dec. 1862. Having obtained a secondary education at Memphis, Tenn., he there published the *Free Trader* with a brother, Avery, in 1881–83, and in 1885–86 toured Europe afoot from Gibraltar to the Bosporus for study of the condition of Continental workingmen and of the protective tariff. In 1910, on the 25th anniversary of this "Tramp" trip through Europe, he covered the same route in an automobile; the contrast between walking and motoring abroad, and the changes that had taken place in the manners and customs of the peoples of Europe between 1885 and 1910 were interestingly set forth in a book entitled 'Seeing Europe By Automobile' (New York 1911). He was appointed by the Secretary of the Interior to write for the United States Labor Bureau a report on the 'Condition of European Labor,' published in the annual report of the bureau for 1886. In 1886–89 he was employed as a special agent of the Department of the Interior for which he made investigations of labor in the United States and the Hawaiian Islands, and in 1891 visited the island prisons of the Mediterranean. He was admitted to the bar in 1892, and in 1893 entered practice at Saint Louis. In 1889–90 and 1895–96 he was labor commissioner of Missouri. His reports on municipal government and street-railway franchises led to his nomination in 1897 for the mayoralty of Saint Louis on the Democratic ticket. He was defeated at that time and also in 1901, when he was candidate of the Public Ownership party. Besides his various reports, he has published 'A Tramp Trip: How to See Europe on Fifty Cents a Day' (1887); 'The Tramp at Home' (1890); 'Afloat and Ashore on the Mediterranean' (1892); 'Miss Chunk' (1899); 'A Lord's Courtship' (1900); 'Seeing Europe by Automobile' (1911); and other works.

MERLE D'AUBIGNÉ, Jean Henri. See D'Aubigné, Jean Henri Merle.

MERLIN, mĕrlĭn, a semi-legendary British prophet and magician, supposed to have flourished toward the end of the 5th century. The accounts of him are hopelessly mixed with fiction. He was said to be the son of a demon and the daughter of a British prince, and was brought up at Caer-Merlin, a city supposed to be the modern Carmarthen. He received from his father the power of working miracles and was the greatest sage of his time, the counsellor and friend of English kings. Vortigen, according to the legend, on the advice of his magicians, had resolved to build an impregnable tower for security against the Saxons but the foundation was scarcely laid when the earth opened by night and swallowed it up. The magicians informed the king that to give firmness to the foundation he must wet it with the blood of a child born without a father. After much search the young Merlin was brought to the king. Merlin disputed with the magicians and showed them that under the foundation of the tower was a great lake, and under the lake two great raging dragons, one red, representing the British, one white, representing the Saxons. The earth was dug open, and the dragons began a furious battle; whereupon Merlin wept, and uttered prophecies respecting the future state of England. Merlin is a character in Tennyson's 'Idylls of the King.' A collection of the prophecies attributed to him appeared in Paris in 1498, at London in 1532 and 1533, at Venice, 1554. They can be traced back to about 1360. His prophecies were published at Edinburgh in 1615 and contain also those ascribed to the Cambrian or Welsh Merlin. Consult Child, 'Her Book of Merlin' (New York 1904); Tennyson, Alfred, 'Idylls of the King.'

MERLIN. This dramatic narrative poem by Edwin Arlington Robinson is among the most distinguished and significant products of recent American literature, and bids fair to take its place beside the best of its very admirable kind. It is entirely modern in its spirit and treatment, with lines like these that mark its date:

> "Time swings
> "A mighty scythe, and some day all your peace
> "Goes down before its edge like so much clover."

In Mr. Robinson's poem King Arthur and his knights are not romantic heroes, as other poets have made them, not "our conception of what knighthood should be"; they are a modern poet's conception of what leaders of men always and universally are,— king, warrior, lover, fool; Arthur, Gawaine, Lancelot, Dagonet. Nor is Mr. Robinson's Merlin like Tennyson's — a magician in his dotage falling a victim to the wiles of a false woman. He is a prophet whose "memories go forward"; he is a man "Who saw himself, A sight no other man has ever seen," and he follows Vivian, "a woman who is worth a grave," because Fate wills it so. It is not the age of chivalry but our own time, our own double world of hope and of reality, with its loves, faith, fears, wars and failures that Mr. Robinson revivifies in 'Merlin.' The philosophy of the poem, that faith and creative love will someday save the world, is a lustrous background for the story: "The torch of woman, who, together with the light That Galahad found, is yet to light the world." As a tale Merlin is vivid and compelling, with scenes, like that of Merlin's first meeting with Vivian and his final parting, which rival the best in drama for beauty and intensity.

Edith J. R. Isaacs.

MERLIN, or **STONE-FALCON,** a small and handsome European falcon (*Æsalon regulus*) prevailingly blue, known throughout the temperate parts of the old world, and very similar to the American pigeon-hawk (q.v.) It is fierce and courageous, and is trained in falconry for the pursuit of the birds that form its natural prey.

MERMAID, a mythical being living within and under the sea, having the form of a woman above the waist and that of a fish below it. They are usually described as having great personal charms, and as using these for the purpose of luring imaginative and amorous men to

destruction by enticing them into the depths of the sea; and, as a correlative, they are sometimes represented as securing their own destruction by quitting the sea, through marriage with some favored human husband by which they magically obtain temporarily a complete human form and soul, but always end in bringing disaster to one or both of the sacrilegious pair. Mermen are also occasionally heard of, but take an unimportant part in the legendary lore of the sea.

This mediæval notion is doubtless a survival of the primitive fancies, half fearful, half poetic, which created the classic conceptions of tritons, nereids, and the like. Shakespeare wrote (Ant. and Cleop., II, 2, 211):

> "Her gentlewomen, like the Nereides,
> So many mermaids, tended her."

All of these ideas probably arose from a mixture of observed human resemblances in certain marine animals with purely mystical fancies which peopled the ocean with similitudes to terrestrial creatures. Primitive men have everywhere derived a large part of their sustenance from the natural products of the waters; and always the vastness and mystery of the sea, full of strange creatures and incomprehensible phenomena, have powerfully affected the imagination of the ignorant and superstitious. To this day the ocean is more familiar and more important in the life of many isolated peoples, who dwell upon its margin and derive their support almost exclusively from it, than is the land; and they invest it and everything it contains with a wondering regard which the inlander can neither share nor understand. To these, even in civilized regions (as on the coast of Ireland or the Hebrides) mermaids remain only one of many present realities, herding sea-cattle and lying in wait for unwary humanity as surely as when sea-horses raced over the Ægean waves with the car of Poseidon or the Sirens tempted the mariners of ancient Greece. In one form or another such stories have been rife in the folk-lore of all maritime peoples since prehistoric times; and, although not so widespread, the belief in mermaids, and their kith and kin, is still a matter of firm faith with hosts of persons in all parts of the world. Folk-lore abounds in evidence of this.

The physical basis for these notions rests upon the resemblance which some marine animals bear to human beings when seen at a distance and in certain attitudes. Such, in northern countries, are various seals, which formerly abounded upon the coasts of western Europe, and still are to be seen in the less frequented spots. They have a way of lifting their round heads and shoulders from the water, with a queer human intelligent look upon their faces, and hugging their young to their bosoms with motherly affection. Impressed with this resemblance, easily turned into a story to beguile a long winter evening or to amuse a child, and growing with imaginative repetitions, the northern peoples were quick to believe the similar and more elaborate stories brought to them by early voyagers from the Mediterranean, and so the tales grew and changed into the rich folk-lore of the coasts of the North Sea.

The southern stories, embellished by classic culture into the sea-myths of Neptune, Proteus and the sea-nymphs of old, and descending into the mermaids and mermen of mediæval folk-lore, yet alive around the Mediterranean and Oriental seas, and among sailors generally, probably have their root in the aspect of the East Indian and African dugongs (q.v.). Near at hand these uncouth monsters would never be mistaken for human beings; but seen at a distance, by fearful and wondering voyages along the coast, such an error might easily happen, for they frequently stand upright among the weedy shallows of the coasts, perhaps draped with loosened vegetation like long hair, and holding to their breasts a young one who nurses from pectoral mammæ much as a human baby would do. Such reports, brought back to the enquiring poetic minds of Greece, might easily blossom into the tales of sea-mythology which formed so large and real a part of the popular belief as well as of the legendary lore of the classic age of India, Persia and the Mediterranean peoples. The fish-gods of the Phœnicians and other idolaters are closely related.

From this has come down to us the extensive and varied use of mermaids and mermen in heraldry. "In French heraldry," says Robinson, "the mermaid is called the Siren; in German she has two tails; in the Italian she carries a harp; and in many cases in each country she is crowned. In England it is a very ancient crest, and among others the lords Byron, the earls of Portsmouth . . . and many others display the sea-maiden in their armorial bearing. With her comb and looking-glass she smiles at us from the shields of the Holmes, Ellises, Lapps; and as a supporter holds up the arms of the Viscounts Boyne and Hood, the earls of Howth and Caledon, and is borne by the heads of the families of Sinclair of Rosslyn, and Scott of Harden. Two mermaids crowned are the supporters of the Boston arms."

Artificial mermaids, claiming to be preserved realities, have formed a part of the stock of curiosities of wonder-shows since time immemorial; and most of those exhibited since the days of Barnum have been the products of Japanese ingenuity.

ERNEST INGERSOLL.

MERMAID'S HEAD, a globose sea-urchin, as one of the heart-urchins.

MERMAID'S PURSE, the egg-case of the skate (or shark), which is often cast up empty on the shore.

MERMAN. See MERMAID.

MERO, or **MEROU,** a West Indian name for a jewfish (q.v.).

MEROBAUDES, Flavius, a Spanish rhetorician and poet of the first half of the 5th century A.D., eminent also as a general, has left us a short hymn in honor of Christ and fragments of five historical poems. L. Jeep in his edition of Claudian (Leipzig 1876–79) publishes four of these poems.

MERODACH, mĕr'ō-dăk, or **BEL-MERODACH.** See BEL.

MEROÉ, mĕr'ō-ē, Egyptian Sudan, a city and state of ancient Ethiopia, in the northeastern part of Africa. The city is still represented by ruins and pyramids near Kabati on the Nile north of Khartum and the state forms the district often spoken of as the Isle of Meroë, extending southeast to Abyssinia, and in the

northwest forming a part of Nubia. It was distinguished for its mineral and cereal wealth and at an early date was the centre of an active and varied commerce including the great caravan trade between Ethiopia, Egypt, Arabia, northern Africa and India. The government was in the hands of a caste of priests, who chose a king who was obliged to live and act according to certain prescribed rules. The priests could sentence the king to death in the name of the gods, and he was forced to submit. The priests were of a lighter complexion than the other inhabitants and may have come from India. Ergamenes, king of Meroë in the 3d century B.C., during the reign of Ptolemy II in Egypt, first made himself independent of this oppressive priesthood by murdering the priests in the golden temple. Meroë and Axum (in Abyssinia), which appears to have been a colony of Meroë, remained the centre of the southern commerce till the time of the Arabians. The existing monuments of their architecture, and many other vestiges, exhibit an advanced religious and social cultivation. The University of Liverpool in 1910–11 financed excavations here, interesting ruins were uncovered and many valued relics obtained. Consult Budge, 'The Egyptian Sudan' (London 1907).

MEROPE, the title of an Italian tragedy in blank verse by the Marquis Francisco Scipione Maffei (1675–1755), first performed at Modena in 1713. Appearing just after the dreary period of 17th century stagnation in Italian letters, it obtained a European reputation. More than 60 editions were published and it was widely translated. It attained in Italy an unprecedented success on the stage and is important also for its influence upon the development of the Italian theatre, whose standard Maffei raised perceptibly.

The subject of the play is taken from Greek mythology as related by Apollodoro (II, 8–5) and Pausanias (IV, 3–6). Merope is the queen of Messena whose husband, Cresfonte, and two children have been murdered by her brother-in-law, Polifonte, who then usurps the royal power and attempts to force the queen to marry him. On this tragic story Euripides wrote his 'Cresfonte,' which is not extant. Maffei was the first modern dramatist to handle the material and reveal its superb possibilities. He dispenses with the love element so prevalent at that time in the French theatre and proves that without it a play can retain the interest of the spectator. His idea is that such a play shall depict but a single passion, in this case a mother's love for her son. The scene (III, 4) in which Merope, believing that she has in her grasp her son's slayer, discovers in him her own son, the transition from anger and vengeance to surprise and then to the motherly love, is profoundly impressive. The dénouement, the death of the tyrant (V, 6), at the foot of the altar, is equally effective. Notable as are the tragedies of Voltaire and of Alfieri dealing with the same subject with the power characteristic of each of these master minds, nevertheless in intensity of plot interest and in dramatic treatment, Maffei's 'Merope' remains unsurpassed. Consult 'Opuscoli e lettere di Maffei' (Milan 1844), for the text and interesting material. A school edition, edited by A. C. Clapin was published in London in 1890. The text, with variations and introduction, appeared later in No. 108 of the 'Bibliotheca Romanica.'

JAMES GEDDES, Jr.

MEROSTOMATA, a sub-class of arthropods, allied to the *Crustacea,* and represented by only a single survivor (the horsefoot crab), but including a large series of fossil forms which flourished in the Palæozoic Age from mid-Cambrian onward. They were somewhat scorpion-like in form, although sometimes of gigantic size, and ranked between the superior trilobites and inferior arachnids. The Merostomata are characterized by having six pairs of ambulatory limbs about the mouth, the first of which terminate in some, if not in all, cases in chiliceræ. The others serve as organs of locomotion, and their coxal joints for prehension and mastication. The prevailing opinion is that the body is divided into two parts (cephalothorax and abdomen) instead of three (head-shield, thorax and abdomen) has been changed by recent discoveries that make the trilobate character of the structure indubitable, and establish a close relationship with the trilobites. The sub-class comprises three orders, *Xiphosura,* the horsefoot crabs (q.v.), several species of which still exist; the *Synxiphosura,* Silurian and Cambrian fossil forms; and *Eurypterida* (see EURYPTERUS). Consult Packard, 'Zoology' (1897), and Zittel-Eastman, 'Textbook of Paleontology' (Vol. 1, 1900), which contains an extensive bibliography.

MEROVINGIANS, mĕr-ō-vin'jĭ-ąnz, the first dynasty of Frankish kings which ruled in the northern part of Gaul, since called France. They derived their name from Merowig (Merovæus), the grandfather of Clovis. They ruled from 496 till 752, when they were supplanted by the Carlovingians. Pepin the Short caused the overthrow by deposing Childeric III, and sending him to a monastery. See FRANCE.

MERRELL, John Porter, American naval officer: b. Auburn, N. Y., 7 Sept. 1846; d. New London, Conn., 8 Dec. 1916. He was graduated at the United States Naval Academy in 1867, served with the European fleet 1867–70; was on signal duty on the Washington and Darien expedition of 1870–71, was in charge of the naval ordnance proving grounds 1877–79. He was also for a time an instructor at Annapolis and had command of the Atlantic fleet. He also did active work in the Department at Washington. He was retired by operation of law 7 Sept. 1908. In 1895–96 he was a member of the State Department Commission to investigate anti-foreign riots in the province of Szechuen, China.

MERRIAM, Augustus Chapman, American classical scholar: b. Locust Grove, N. Y., 1843; d. Athens, Greece, 1895. He was graduated at Columbia University in 1866 and after 1868 was connected with that institution successively as tutor, adjunct professor of Greek and professor of Greek archæology and epigraphy. Dr. Merriam did much to promote the study of classical archæology in the United States. In 1887–88 he was director of the American School at Athens. He published 'The Phæacians of Homer' (1880); 'The Greek and Latin Inscriptions on the Obelisk Crab in Central Park' (1883); 'The Sixth and Seventh Books of Herodotus' (1885); 'The

Law Code of Gortyna in Crete' (1886); 'Telegraphy among the Ancients' (in Papers of the Archæological Institute of America: Classical Series III, Cambridge 1890).

MERRIAM, mĕr'i-ăm, **Clinton Hart,** American biologist and author: b. New York City, 5 Dec. 1855. He was graduated from Yale in 1877 and from the College of Physicians and Surgeons in New York in 1879, and practised medicine 1878–85. He was United States Bering Sea commissioner in 1891 and visited Alaska in the interest of fur seal investigations. He has held various commissions from the government in the field of biology and has made explorations in its interest in the far West. In 1910 he was placed in charge of the biological and ethnological investigations carried on under the fund established by Mrs. Harriman. He has written 'Birds of Connecticut' (1877); 'Mammals of the Adirondacks' (1882–84); 'Results of Biological Survey of San Francisco Mountain Region and Desert of Little Colorado in Arizona' (1890); 'Flora and Fauna of the Death Valley Expedition' (1893); 'Life Zones and Crop Zones of the United States' (1898); 'Indian Population of California' (1905); 'Totemism in California' (1908); 'The Dawn of the World' (1910), and about 400 papers on zoological, botanical and ethnological subjects.

MERRIAM, Henry Clay, American soldier: b. Houlton, Me., 13 Nov. 1837; d. 1912. He was graduated from Colby University, and began the study of law; but in 1862 entered the Union army as captain in a Maine regiment. He was at the battle of Antietam in 1862, and organized the colored troops in 1863, being lieutenant-colonel of the Louisiana Native Guard (a negro regiment) at the close of the war; he led the assault on Fort Blakely 9 April 1865, and obtained a medal of honor from Congress for gallant conduct. In 1866 he was appointed major in the regular United States army, and rose to the rank of brigadier-general in 1897 and major-general of volunteers in the Spanish War, 1898. He served in many expeditions against the Indians, and protected American citizens in the valley of the Rio Grande in the revolutionary troubles (1873–76). In 1898 he was commander of the departments of the Columbia and California, and organized, equipped and forwarded the troops to the Philippines; and in 1899 was sent to the Philippines in command of the army of occupation. In January 1900 he was placed in command of the Department of the Colorado, and in 1901 was retired from active service. He is the inventor of the Merriam infantry pack.

MERRIAM, John Campbell, American educator and paleontologist: b. Hopkinton, Iowa, 20 Oct. 1869. In 1887 he was graduated at Lenox College, Iowa, and in 1893 received the degree of Ph.D. at the University of Munich. In 1894–99 he was instructor in paleontology and historical geology; in 1899–1905 assistant professor; in 1905–12 associate professor, and after 1912 professor of paleontology at the University of California. Professor Merriam is a Fellow of the American Association for the Advancement of Science, of the American Palæontological Society, and other learned bodies. He is the author of numerous papers on fossil reptiles and fossil mammals of western North America, and on the general historical geology of the Pacific Coast region.

MERRIAM, William Rush, American financier: b. Wadham's Mills, N. Y., July 1849. He was graduated from Racine College, Wisconsin, in 1871 and entered the First National Bank of Saint Paul where he was cashier in 1873. In 1880 he was president of the Merchants' National Bank there and in 1882 became a member of the State legislature of Minnesota and was speaker in 1886. He was elected governor of Minnesota in 1889 and was director of the United States census in 1898–1903.

MERRICK, Frederick, American educator: b. Wilbraham, Mass., 1810; d. 1894. He received his education at the Wilbraham Wesleyan Academy and at Wesleyan University. He was made principal of Amenia Seminary at Amenia, N. Y., and held the chair of natural science at Ohio University, Athens, Ohio, from 1838 to 1843. In the latter year he began his connection with Ohio Wesleyan University which continued until his death. For 13 years he was president of that institution. Merrick was a supporter of the Underground Railway and otherwise an active Abolitionist. He was ordained to the ministry of the Methodist Episcopal Church and took part in the General Conferences of 1860, 1864 and 1876. He endowed the Merrick lectureship at Ohio Wesleyan University. He published poems and contributions in religious journals and the volume, 'Formalism' (1865).

MERRICK, mĕr'ik, **Leonard,** English novelist: b. Belsize Park, London, 21 Feb. 1864. He was educated at Brighton College, and among his novels, several of which have been reprinted in this country, are: 'Mr. Bazalgette's Agent'; 'The Man Who Was Good'; 'Cynthia: a Daughter of the Philistines'; 'When Love Flies Out of the Window.' He is also the author of several plays.

MERRIFIELD, mĕr'i-fēld, **Webster,** American educator: b. Williamsville, Vt., 27 July 1854; d. 22 Jan. 1916. He was graduated from Yale in 1877 and was an instructor there 1879–83. From 1884 to 1891 he was professor of Greek in the University of North Dakota, professor of political economy, 1891–1903, and president of the institution since 1891.

MERRILL, Elmer Truesdell, American university professor: b. Millville, Mass., 1 Jan. 1860. In 1881 he was graduated at Wesleyan University and subsequently studied at Yale, 1885–86, the University of Berlin, 1886–87, Rome 1892, 1895, 1898–99, 1903, and in England. In 1882–83 he was instructor in classics at the Massachusetts State Normal School, Westfield; in 1883–86 tutor in Latin at Wesleyan; in 1887–88 professor of Latin at the University of Southern California; in 1888–1905 Robert Rich professor of Latin language and literature at Wesleyan University. In 1905 he became professor of Latin language and literature at Trinity College, Hartford, and in 1908 was appointed professor of Latin at the University of Chicago. Dr. Merrill was chairman of the American School of Classical Studies in Rome in 1900–01 and professor there in 1898–99. Since 1906 he has been associate editor of *Classical Philology.* He has edited 'Poems of Catullus' (1893); 'Fragments of Roman Satire' (1897); 'Selected Letters of the Younger Pliny' (1903); 'C. Plini Cæcili Secundi Epistularum Libri Novem' (1914).

MERRILL, Frederick James Hamilton, American geologist: b. New York, 30 April 1861. In 1885 he was graduated at the Columbia School of Mines, received the degree of D.Ph. there in 1890 and was assistant in the New Jersey Geological Survey 1885–89. In 1890–93 Dr. Merrill was assistant State Geologist of New York. In 1890–94 he was assistant director, in 1894–1904 director of the New York State Museum. He had charge of the New York exhibits at the expositions, Chicago 1893, Buffalo 1901 and Saint Louis 1904. Since 1904 he has been in private practice as mining geologist. He published 'Salt and Gypsum Industries in New York' (1893); 'Mineral Resources of New York' (1896); 'Road Materials and Road Building in New York' (1897); 'Natural History Museums of the United States and Canada' (1903).

MERRILL, mĕr'il, **George Edmands,** American Baptist clergyman and educator: b. Charlestown, Mass., 19 Dec. 1846; d. Hamilton, N. Y., 11 June 1908. He was graduated from Harvard in 1869, and from the Newton Theological Seminary in 1872. Entering the Baptist ministry, he was pastor at Springfield, Mass. (1872–77); at Salem, Mass. (1877–85); at Colorado Springs (1885–87); and at Newton, Mass. (1890–99). In 1899 he was called to the presidency of Colgate University, Hamilton, N. Y., where his administration improved the standard and awakened interest in many new lines of college activity. He wrote 'Story of the Manuscripts' (1881); 'Crusaders and Captives' (1890); 'The Reasonable Christ' (1893); 'The Parchments of Faith' (1895).

MERRILL, George Perkins, American geologist: b. Auburn, Me., 31 May 1854. He was graduated at the University of Maine in 1879. He has been head curator of the department of geology in the United States National Museum since 1897, and professor of geology and mineralogy in George Washington University since 1893. He was special agent for the 12th census. He has published 'Stone for Building and Decoration' (1891–1903); 'Rocks, rock-weathering and Soils' (1897–1907); 'Handbook of the Department of Geology United States National Museum' (1892); 'Non-Metallic Minerals' (1901–04–10); 'History of North American Geology' (1905); 'Catalogue of Meteorite Collection in United States National Museum' (1915), and many papers to scientific societies. Dr. Merrill is a member of the Geological Society of America, of the Washington Academy of Science and of other learned bodies.

MERRILL, Lewis, American soldier: b. New Berlin, Pa., 28 Oct. 1834; d. Philadelphia, 27 Feb. 1896. He was graduated from West Point in 1855, and at the outbreak of the Civil War was appointed colonel of a volunteer cavalry regiment and served with distinction through the war. He was active in warfare with the Indians and performed the notable service of breaking up the Kuklux Klan in 1868, which was recognized by Congress after some delay by promotion to the rank of lieutenant-colonel of cavalry. He retired from active service in 1891.

MERRILL, Selah, American Congregationalist clergyman and archæologist: b. Canton Centre, Conn., 2 May 1837; d. 1909. He was educated at Yale and at the New Haven Theological Seminary and was ordained to the ministry in 1864 when he entered the Federal army as chaplain. He held pastorates in Leroy, N. Y., and in San Francisco, and was for a time professor of Hebrew at Andover Theological Seminary. In 1882–86, 1891–94 and after 1898 he served as United States consul at Jerusalem and made valuable archæological researches and discoveries there. In 1907 he became consul at Georgetown, Guiana. He wrote 'East of the Jordan' (1881); 'Galilee in the Time of Christ' (1881); 'The Site of Calvary' (1885); etc.

MERRILL, Stephen Mason, American Methodist bishop: b. Jefferson County, Ohio, 14 Sept. 1825; d. Keyport, N. J., 12 Nov. 1905. He studied for the ministry and was ordained by the Ohio Conference in 1846, and in 1868–72 was editor of the 'Western Christian Advocate.' In 1872 was appointed bishop. He published 'Christian Baptism'; 'Union of American Methodism'; 'Sanctification' (1901); 'Miracles' (1902).

MERRILL, William Emery, American military engineer: b. Fort Howard, Wis., 17 Oct. 1837; d. near Edgefield, Ill., 14 Dec. 1891. He was graduated from West Point in 1859 and for a year prior to the outbreak of the Civil War was assistant professor in engineering at West Point. He went to the front in 1861, and served with distinction at Yorktown, Chickamauga, Missionary Ridge and other famous battles and in 1864–65 had charge of the railroads which supplied the armies in Georgia and Tennessee and was brevetted colonel for his services. After the war he served as chief engineer on the staff of General Sherman and was engaged in western surveys and the improvement of rivers. He was in charge of the improvement of the Ohio River at the time of his death which occurred on a railroad train. He wrote 'Iron Truss Bridges for Railroads' (1870) and 'Improvement of Non-Tidal Rivers' (1881).

MERRILL, Wis., city, county-seat of Lincoln County; on the Wisconsin River, and on the Chicago, Milwaukee and Saint Paul Railroad; about 145 miles north of Madison. It was settled in 1875 and incorporated in 1883. It is in a part of the State where the chief industries are connected with lumbering. Merrill has manufacturing establishments for shingles, laths, planed lumber, sawed lumber, sash, doors and blinds, clapboards, lumber for interior finish, flooring, etc. It has a high school, a daily newspaper, an opera house, a courthouse which cost about $100,000, and the T. B. Scott Public Library. Pop. 8,689.

MERRIMAC, mĕr'i-măk, a river of New Hampshire, which has its source at Franklin where the Pemigewasset and Winnipisaukie rivers unite. The Winnipisaukie is the outlet for the lake of the same name; the Pemigewasset has its rise in the northern part of Grafton County, in the White Mountains. The Merrimac flows nearly due south into the State of Massachusetts when it turns, continuing its course east, then northeast to the Atlantic Ocean. The mouth of the river is a tidal estuary which is navigable for steamers of good size. At the entrance is a sand bar which is constantly changing, and which is a hindrance

to navigation. The river is navigable for small steamers as far as Haverhill. The extensive water-power of the Merrimac has been the main cause of the development and prosperity of the entire region. Some of the largest cotton-mills of the country were erected on its banks, and many woolen mills, carpet mills and other manufactories. Newburyport is at the mouth of the river. Other important places on its banks are Haverhill, Lawrence and Lowell, in Massachusetts, and Nashua, Manchester and Concord in New Hampshire. The length from the source of the Pemigewasset to the ocean is 183 miles; its drainage area 5,000 miles.

MERRIMAC, The, a frigate of the United States navy. See MONITOR AND MERRIMAC, THE.

MERRIMAN, mĕr'ĭ-măn, **Henry Seton.** See SCOTT, HUGH STOWELL.

MERRIMAN, Mansfield, American engineer and author: b. Southington, Conn., 1848. He graduated from the scientific department at Yale in 1871, was with the United States Corps of Engineers for two years, and in 1875 became instructor in civil engineering at the Sheffield Scientific School (Yale). In 1878 he resigned to accept a position as professor of civil engineering at Lehigh University, which he occupied for 29 years. During a part of this period he was also called upon to assist the United States Coast and Geodetic Survey. Since 1907 he has devoted most of his time to consultation on important works, mainly in hydraulics. He has written many textbooks, widely used by the colleges. Among them are 'Method of Least Squares'; 'Mechanics of Materials'; 'A Text Book on Roofs and Bridges' (4 vols., Jacob co-editor); 'Treatise on Hydraulics'; 'Handbook for Surveyors'; 'Strength of Materials; 'Precise Surveying'; 'Elements of Sanitary Engineering'; 'Elements of Hydraulics.' Every one of these has passed through several editions. He was also chief editor of the 'American Engineers' Pocket Book,' and has contributed to numerous technical and scientific papers.

MERRITT, Ernest George, American physicist: b. Indianapolis, Ind., 28 April 1865. In 1881–82 he studied at Purdue University and in 1886 was graduated M.E. at Cornell. He made graduate studies at Cornell in 1887–88 and at the University of Berlin in 1893–94. In 1888–91 he was instructor in physics, in 1892–1903 assistant professor, and after 1903 professor at Cornell. From 1909 to 1914 he was dean of the Graduate School. Dr. Merritt is a contributor to scintific journals on investigations in physics.

MERRITT, mĕr'ĭt, **Wesley,** American soldier: b. New York, 16 June 1836; d. Washington, D. C., 3 Dec. 1910. He was graduated from West Point in 1860 and served with honor through the Civil War and for bravery at Gettysburg was brevetted major. His services at the battles of Yellow Tavern and Winchester gained for him the rank of brigadier-general and major-general. He was assigned chiefly to frontier duty from the close of the Civil War until 1882 when he was made superintendent of West Point and in 1887 placed on duty at Fort Leavenworth, Kan. He commanded the Department of the East, 1897–98 and in May 1898 was put in command of the United States troops in the Philippines and conducted the campaign to a successful termination. After the close of the Spanish-American War he was ordered to Paris in order to assist the work of the American peace commissioners. He was retired in June 1900.

MERRITT, William Hamilton, Canadian mining engineer: b. Saint Catherines, Ontario, 1855. He received his education at Upper Canada College, the Royal Military School, and the Royal School of Mines, London. Returning to Canada he practised his profession in Toronto; was a member of the Canadian commission to the Paris Exposition of 1878 and subsequently was made lecturer in mining engineering in the Kingston School of Mining. He became a cornet in the governor-general's body-guard in 1884, took part in suppressing Riel's rebellion in 1885, in the Boer War in 1899–1902. Mr. Merritt was also chosen president of the Ontario Mining Institute. He contributed to the 'Proceedings' of the London Geological Society, the 'Proceedings' of the American Institute of Mining Engineers; the 'Proceedings' of the Canadian Institute and is author of 'Economic Minerals of Ontario' (1896) and 'Field Testing for Gold and Silver' (1900).

MERRY, William Walter, English Anglican clergyman and classical scholar: b. Worcestershire, 6 Sept. 1835. He was educated at Balliol College, Oxford, and has been rector of Lincoln College there from 1884. He is widely known for his editions of the classics published by the Clarendon Press and including the 'Odyssey' (Books I to XII, 66th thousand; XIII to XXIV, 16th thousand; and the plays of Aristophanes. He is the author of 'The Greek Dialects' (1875).

MERRY DEL VAL, Rafael, cardinal of the Roman Catholic Church: b. London, 10 Oct. 1865. His father, Don Marquis Merry del Val, was partly of Irish ancestry, being descended from the Irish family Merry established in Spain; and his mother, daughter of Don Pedro José de Zulueta, Count de Torré Diaz, although of Spanish origin, was English by education. At the time of Rafael's birth his father was secretary to the Spanish embassy, London, the boy's early studies being pursued in the English metropolis. Later he attended the Jesuit College of Saint Michael, Brussels, afterward taking a course at Ushaw, and was subsequently chosen private tutor to Alfonso XIII. When his father was appointed Spanish Ambassador to the Vatican young Rafael accompanied him to Rome and entered the Gregorian University where, in preparation for the priesthood, he studied philosophy and theology, receiving the degree of doctor of philosophy and theology conferred by this institution. At the age of 24 he was ordained a priest and, although intended for the diocese of Westminster, was retained in Rome and soon became cameriere participante to Pope Leo XIII. Four years later he was appointed master of the robes and privy chamberlain to Leo XIII, taking up his residence in the Vatican. Despite Monsignor Merry del Val's youth his linguistic knowledge, which included a fine command of English, French, Spanish and Italian, and his cosmopolitan training qualified him admirably for the fulfilment of various important missions. In 1887 he accom-

panied the papal envoy, Monsignor Scilla, to Queen Victoria's jubilee and in 1896 went as papal delegate to Canada to investigate the question of separate Catholic schools in Manitoba, his report to the Holy See calling forth the *Affari vos,* Leo XIII's famous letter to the Catholics of Canada. It was likewise in 1896 that Monsignor Merry del Val was made secretary to the commission appointed to determine the validity of Anglican orders. In 1899–1901 he was president of the College for Noble Ecclesiastics, in 1900 was consecrated titular bishop of Nicæa and in 1902 made titular archbishop of Nicocia. The same year he was appointed papal envoy to the coronation of King Edward VII and his book on the 'Truths of the Papal Claims' was given to the public. In the interregnum following the death of Leo XIII, Cardinal Oreglia, dean of the College of Cardinals, named Archbishop Merry del Val secretary to the conclave of cardinals that elected Pius X. This pontiff appointed the young archbishop Papal Secretary of State and on 9 Nov. 1903, elevated him to the cardinalate. Cardinal Merry del Val is secretary of the Congregation of the Venerable Fabric of Saint Peter's; archpriest of the Vatican Basilica and also a member of the Commission for the Codification of Canon Law. His term of office as Papal Secretary of State expired at the death of Pius X.

MERRY ENGLAND, a popular name for England. The word merry is used, not in the sense of gaiety, but according to its earlier meaning, that is, agreeable, or pleasant; as in the phrase, "merry month of May."

MERRY MOUNT, a district near the present town of Quincy, Mass., which in the early colonial days of New England was occupied by a party of men belonging to the Church of England. They paid little respect to the rigid and austere habits of the Puritans whom they greatly offended by the laxity of their manners. An attack was made upon this settlement by the forces of the Plymouth colony in 1630. John Lothrop Motley, the historian, produced in 1849 a romance entitled 'Merry Mount.'

MERRY WIVES OF WINDSOR, The, Shakespeare's greatest prose play. It contains only about 15 per cent of verse lines, and in the spirit of its scenes is equally subdued, save for a flash of the old fire in the fairy poetry at the close. Dennis and Rowe report a story, current at the opening of the 18th century and inherently plausible, to the effect that this play was written within two weeks to the special order of Queen Elizabeth, who desired to see Falstaff in love. The wish is worthy of the Queen's taste and the manner in which it was satisfied indicates that Shakespeare did not work spontaneously. In point of time the play belongs with the greatest comedies — with 'Much Ado about Nothing,' 'Twelfth Night,' and 'As You Like it.' It was licensed for publication in January 1602 and most likely composed shortly before, for it is hard to believe that the Falstaff of this play can have been created while recollection of the great Falstaff of 'Henry IV' (1597, 1598) was very fresh in the author's mind. There is a radical difference between the two characters. In the 'Merry Wives' Falstaff loses most of his peculiar wit and all the graver, pathetic side of his character. He loses his charm, not only for the spectator but for his companions. There is a sense of positive disaster in seeing the invincibly lovable knight of 'Henry IV' and 'Henry V' betrayed by his own creatures, Nym and Pistol (II, i), just as there is in hearing the Titanic liar of the Gadshill episode ignominiously relating to Brook-Ford (in III, v) the whole sorry truth of his discomfiture. "I do begin to perceive that I am made an ass," he is forced to say in the final scene, and Shakespeare must have felt as keenly as his readers the pity of thus reducing Falstaff to the level of Dogberry and Bottom. The play is brisk and entertaining, and is constructed with masterly technique, but it deals wholly with the externals of character and with unlikely incidents. Its type-figures — Slender, Sir Hugh, Dr. Caius, the Host, — when compared with Mercutio, Sir Toby, or the old Falstaff, are like pygmies after giants. There is no reason to believe that 'The Merry Wives of Windsor' was regarded with special favor by the Elizabethans. After the Restoration it seems to have become one of the most popular of Shakespeare's comedies, though Samuel Pepys registers emphatic dissent when noting in his diary that on 15 Aug. 1668 he saw 'The Merry Wives of Windsor,' "which did not please me at all, in no part of it." Precisely a century after its first publication, in 1702, a revised version by Dennis was brought out with the title, 'The Comical Gallant, or The Amours of Sir John Falstaffe.' Since the rise of the romantic movement, it has been one of the least liked of Shakespeare's comedies.

TUCKER BROOKE

MERSEN, Treaty of, effected 8 Aug. 87[illegible] at Mersen, Holland, between Charles the Bald of France and his half brother Louis of Germany by which Lotharingia or Lorraine, the kingdom of their nephew Lothair II (d. 869) was divided between the east and west Frankish realms — France and Germany. From this date the history of the two national divisions and of the European state system begins.

MERSEY, mėr'zĭ, England, a river formed at Stockport by the union of the rivers Gorle and Tame. It flows in a general southwest direction to Runcorn, where it expands into an estuary two to three miles broad, near the mouth of which, on the north side, is Liverpool with Birkenhead opposite, and below which it joins the Irish Sea. Since 1886 a railway tunnel under the Mersey has afforded communication between Liverpool and Birkenhead. The entire length of the river, including the estuary, is 70 miles. Principal affluent, the Irwell, by which it is navigable. The Bollin and the Weaver are affluents from Cheshire. With the Mersey and Irwell is now closely connected the great Manchester shipcanal (q.v.) which opens into it.

MERSHON, Ralph Davenport, American electrical engineer and inventor: b. Zanesville, Ohio, 14 July 1868. In 1890 he was graduated at Ohio State University; from 1891 to 1901 was connected with the Westinghouse Company at Pittsburgh and New York, and thereafter entered private practice as consulting engineer. He installed several important high voltage transmission systems in Colorado, Montreal, Tokio, Japan and in South Africa. He invented the six-phase rotary converter, a com-

pounded rotary converter, a system of lightning protection for electric apparatus and a compensating voltmeter. In 1912–13 he was president of the American Institute of Electrical Engineers and is a member or Fellow of several scientific societies. He is the author of numerous technical papers.

MERSINA, Asia Minor, town on the southeast coast of Asia Minor, five miles south by west of Adana. It is the principal seaport of the south coast. The climate is unhealthful in summer. The harbor is an open roadstead. An American mission is located here and there is also a consular agent of the United States. Pop. 15,000, half of whom are Christians, Armenian, Greek and European.

MERSON, Luc Oliver, French painter: b. Paris, 21 May 1846. He studied at the École des Beaux Arts and was a pupil of G. Chassevent and of Pils. His first picture exhibited in the Salon was 'Leucothea and Anaxandros' (1867). In 1869 he carried off the Grand Prix de Rome, the supreme ambition of art students, by his painting 'The Soldier of Marathon.' He produced the same year 'Apollo the Destroyer,' now in the Museum of Castres. In 1872 he painted 'The Martyrdom of Saint Edmund of England' (Museum of Troyes). Since then he has devoted his pencil to the portrayal of legendary and mythological scenes and incidents. His chief works in this class are 'The Vision, a Legend of the 14th Century' (1873); 'A Patriot Sacrifice' (1874); 'Saint Michael' (1875); 'Saint Francis and the Wolf of Agubbio' (1878); 'Saint Isidore' (a triptych) (1879); 'The Judgment of Paris witnessed by Eros' (1884); 'Mankind and Fortune' (1892); 'The Annunciation' (1903). He has also frescoed with scenes from the life of Louis IX the walls of the Saint Louis gallery in the Palais de Justice at Paris.

MERTHYR TYDFIL, mĕr'thĕr tĭd'vĭl, or **TYDVIL,** Wales, a market and manufacturing borough of Glamorganshire, 24 miles by rail northwest of Cardiff, on the Taff, at the northern end of Taff Vale. It is the third largest place in Wales, and with the suburbs is 27 square miles in area. From an unimportant village in 1780, Merthyr Tydfil has become a prosperous centre of steel and iron manufactures, owing to its situation near the valuable coal and mineral fields of South Wales. Bessemer steel was first rolled into rails here. Since the local iron became reduced, the pig is mainly imported from Spain. The town has undergone much modern improvement and is noted for its municipal enterprises, one of its investments being the purchase of the historic Cyfarthfa Castle, with a small lake and 62 acres of ground, and converting them into a public park. Public baths and two sewage farms are maintained. Pop. about 83,946.

MERTON, Walter de, English bishop: d. about 27 Oct. 1277. He was graduated at Oxford University, of which he was appointed chancellor by Henry III in 1261, and three years later instituted the collegiate, or separate house system of the English University, by establishing the college which is called after his name. Here the secular clergy were to be educated in philosophy, the liberal arts and theology. The system he thus introduced has been the secret of success both to Oxford and Cambridge, and was originated chiefly with the object of raising up secular schools which might check the power of the monasteries and eventually supersede them as centres of education. He was appointed bishop of Rochester in 1274.

MERTON COLLEGE, Oxford, England, was originally founded in 1264 at Malden, Surrey, by Walter de Merton (q.v.), and removed to Oxford in 1274, where its collegiate buildings are among the oldest and most interesting in the city, the chapel especially being noted for its proportions and beauty. The foundation consists of a warden, 19 fellows, 18 postmasters or scholars, 34 exhibitioners, four lecturers, two chaplains, and in 1912, 150 undergraduates. Among its famous alumni are Harvey, the demonstrator of the circulation of the blood. Anthony Wood, Sir Thomas Bodley and Sir Richard Steele.

MERU, mĕr'oo, in Hindu mythology, the sacred mountain at the earth's centre on whose summit resides Siva, sustaining and uniting earth, heaven and hell. It contained the cities of the Hindu gods, and was the abode of the celestial beings. It was believed that the planets revolved around it.

MERV, mĕrv (sometimes written Meru), Russia, an oasis in Central Asia, in the south of Western Turkestan, and about 120 miles north of the frontier of Afghanistan, now traversed by the railroad from the Caspian to Samarkand. It has an area of 1,900 square miles, and is crossed by the 37th meridian and 62d parallel. One-fourth of this area is artificially irrigated. It is watered by the Murghab and produces wheat, cotton, sugar, silk, etc. In the midst of the oasis are the ruins of the ancient town of Merv, founded by Alexander the Great, and subsequently held by Syrians, Arabs, Mongols and Persians. A new town New Merv, has grown up on the Murghab, where the Trans-Caspian Railway crosses the river, with a citadel; it has been made the capital and its population is about 15,000. The oasis generally is the principal seat of the Tekke Turcomans, who from this centre used to make predatory incursions into Persia and Afghanistan. In 1815 the oasis was subjugated by the Khan of Khiva, to whom it remained tributary for about 20 years. Subsequently Persia attempted to make good the claims which it had long made to this district, and in 1860 fitted out an expedition for the purpose, which, however, miscarried completely, as did another expedition in 1876. In 1881 General Skobeleff led a Russian expedition against the Tekke Turcomans, captured their stronghold of Geok-Tepe, and received the submission of their principal leader. The district of Merv subsequently came under the power of Russia. Merv is of great strategical importance, and considerable interest was attached to it in connection with the advances made by Russia in the direction of India. Pop. 250,000.

MERWIN, Henry Childs, American lawyer: b. Pittsfield, Mass., 5 Aug. 1853. He was graduated from Harvard in 1874 and was for some years lecturer in the law school of Boston University. Has been employed by the Massachusetts legislature since 1900 to write and revise statutes. Beside editing several legal works he is the author of 'Patentability of Inventions' (1884); 'Road, Track and Stable',

(1893); 'Life of Aaron Burr' (1899); 'Life of Thomas Jefferson' (1901); 'Life of Bret Harte' (1910).

MERYCODUS, or **COSORYX,** a small antlered antelope fossil in the Miocene formations of the western United States. It was about the size of a dorcas gazelle, but with shorter limbs and neck and belonged to the family *Antilocapridæ,* now represented only by the pronghorn; but it bore relatively tall three-tined antlers, which were deciduous and precisely like those of deer. Minute lateral toe-rudiments hung high above all the hoofs, but these were relatively smaller than in deer; in the modern pronghorn no trace of these remains. It was probably a collateral ancestor of the antelopes. *Blastomeryx* is a closely related genus somewhat more primitive. A very complete skeleton, collected by W. D. Matthew, is exhibited in the American Museum of Natural History at New York.

MÉRYON, Charles, shärl mā-rē-ôn, French etcher: b. Paris, 23 Nov. 1821; d. Charenton, 14 Feb. 1868. He entered the navy, after studying at Brest, but failing health, forced his resignation, and he settled in Paris, studying etching there. His chief works were picturesque spots in old Paris, many since destroyed. A series of 23 plates by him appeared 1850–54. His last years were spent in an insane asylum at Charenton. Consult Wedmore, 'Méryon and Méryon's Paris' (1879); Burty, 'L'Œuvre de Charles Méryon,' translated by Huish (1879); Bouvenne, 'Notes et Souvenirs sur Charles Méryon' (1883).

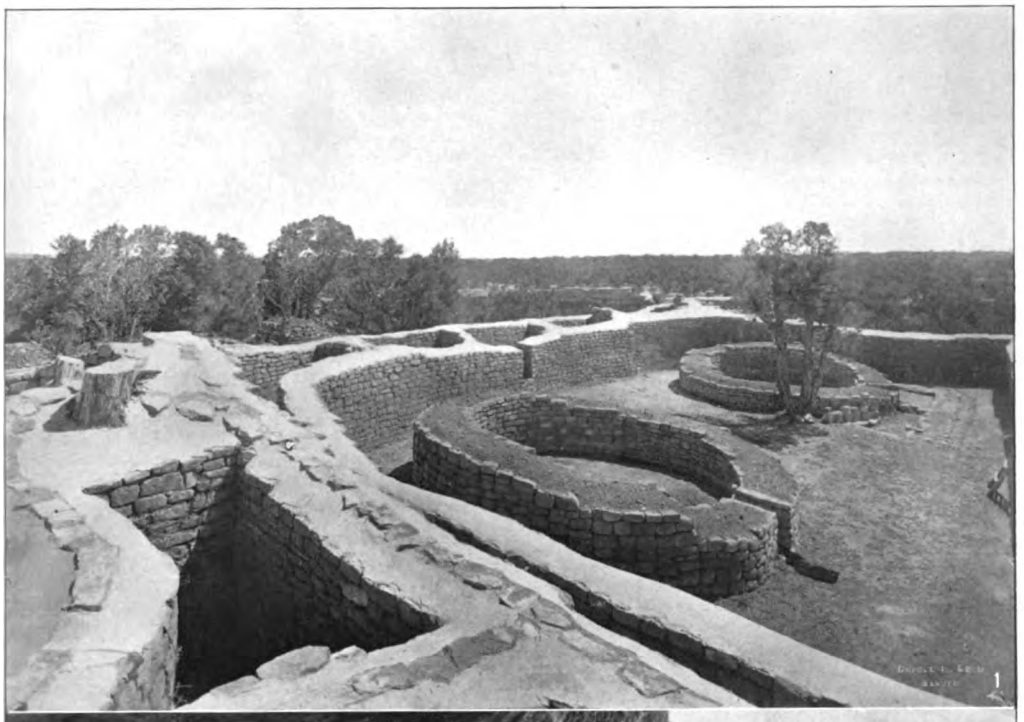
MESA, Ariz., town in Maricopa County, on the Arizona Eastern Railroad, 20 miles southeast of Phœnix. It contains numerous Toltec remains, a government experimental farm and power plant, the Granite Reef Dam, a public library and fine school buildings. It has extensive agricultural, fruit-growing and stock-raising interests. The town grew from a Mormon colony established here in 1879. The municipality owns the water supply system. Pop. 1,690.

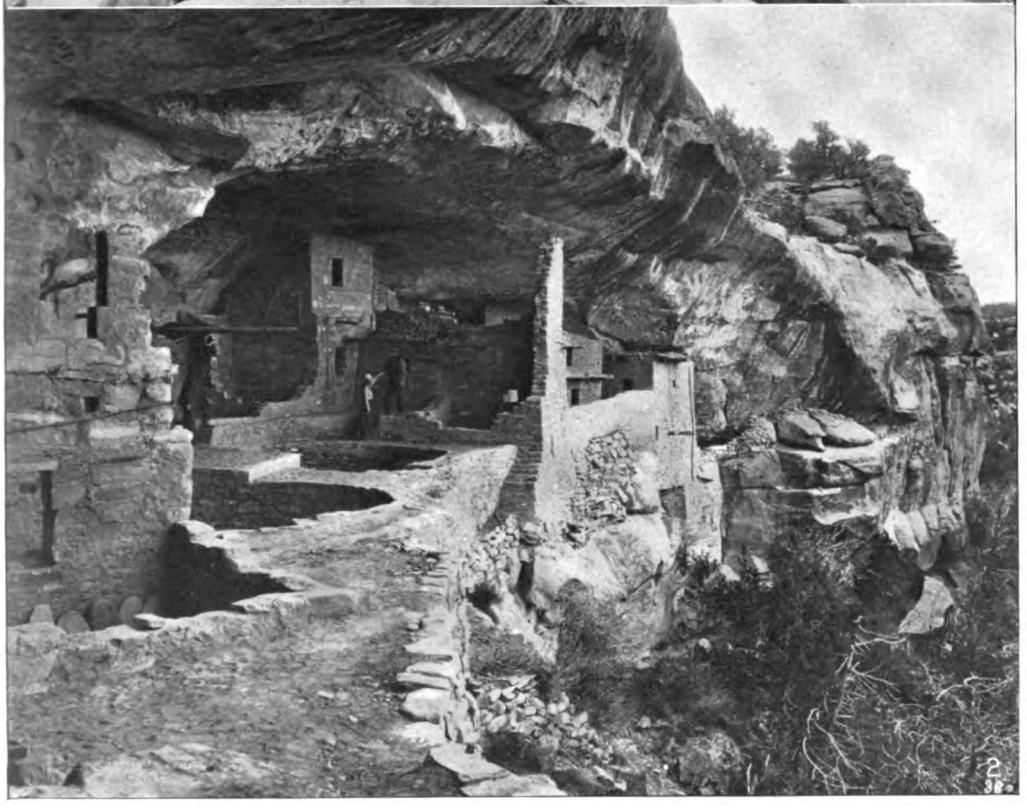
MÉSA, or **TABLE MOUNTAIN,** any flat topped hill which stands out prominently above the surrounding area. The flatness is usually due to a horizontal layer of hard rock capping the hill. Many of our most noted mesa areas are the result of lava flows that cap and protect softer layers beneath. Butte is sometimes used in a similar sense, though it is more often applied to steep-sided prominent hills that are not notably flat-topped.

MESA VERDE NATIONAL PARK, Colo., a reservation of 48,966 acres in Montezuma County, southwestern Colorado. Within its area, in canyons of the Mancos River, are the most remarkable of the many ruins of prehistoric cliff dwellings in the southwestern United States. The Mesa Verde (Sp. "green-table" so named from its vegetation) is a high table-land, dividing the Mancos and Montezuma valleys. This mesa is elevated above the valleys some 2,000 feet, and rises abruptly from their floors, with precipitous sides, like the walls of a canyon. The northern extremity of this great mesa terminates in Point Lookout, which juts out between the two valleys, a landmark for miles in all directions. The highest part of the Mesa Verde National Park, Park Point, near the northern boundary, is 8,572 feet above sea-level, while Point Lookout has an elevation of 8,428 feet above sea-level. The northern edge of the mesa terminates in a precipitous bluff, averaging 2,000 feet above the floor of the Montezuma Valley. The general slope of the mesa is to the south, so that a person on the northern rim has a view in all directions. The surface of this table-land is broken by innumerable canyons, which start from the very edge of the mesa on the northern and western sides, and, growing deeper and more rugged as they descend, finally open out into the Mancos Canyon. These canyons have many great caverns in their side walls, with the overhanging rock for roofs, and in these caverns are found the ruins of the cliff dwellings. The principal ruins are found in Navajo, Cliff, Soda, Long and Rock Canyons, though there are hundreds of lesser ruins in all the canyons in the park. Spruce Tree House is in Spruce Canyon, a branch of Navajo; Cliff Palace is in Cliff Canyon; Balcony House is in Soda; Peabody House and Inaccessible are in Navajo; Long House is in Rock Canyon. A ruin in Long Canyon was entered by one of the rangers in 1914 for the first time since it was abandoned by its original tenants. Its difficult approach had protected it from all vandalism, and it was found just as it had been left, no one knows how long ago. One sealed room contained a fine collection of jars and implements. It was reached by swinging a ladder over the cliff, anchoring it at the top, and letting it swing. Down this swinging ladder the ranger went and then anchored it at the bottom. Now tourists make the descent. These ruined houses, or villages, are found in the recesses of the canyon walls and, protected from the weather, are remarkably well preserved. Some of them are small, with only a few rooms, while others are large and must have accommodated a large population. The ruins found on the mesas, without the protection of the overhanging cliffs, have not withstood the ravages of time and are now but mounds of stone and earth.

While the ruins in the Mancos Canyon were explored as early as 1874, the most important escaped discovery until 1888, when R. Wetherill and C. Mason of Mancos, in search of a stray herd one day in December, penetrated a pinyon wood to the edge of a deep-side canyon. "On the opposite cliff, sheltered by a huge, massive vault of rock, there lay before their astonished eyes a whole town, with towers and walls, rising out of a heap of ruins." They named the place "Cliff Palace," and the same day discovered nearby, in another canyon, another large cliff dwelling to which they gave the name of Spruce Tree House, from a great spruce growing among the ruins. The word dwelling is misleading, for most of these buildings were villages. Spruce Tree House, for instance, was undoubtedly a town of importance, harboring at least 350 inhabitants.

The arrangement of houses in a cliff dwelling of the size of Cliff Palace, for example, is characteristic and intimately associated with the distribution of the social divisions of the inhabitants. The population was composed of a number of units, possibly clans, each of which had its own social organization more or less





1 SUN TEMPLE, MESA VERDE NATIONAL PARK, SOUTHWESTERN COLORADO

This ruin, in "The Land of the Cliff Dwellers," was excavated in 1915 by Dr. J. Walter Fewkes, of the Smithsonian Institution, Washington, D. C. It is 131 feet long. Dr. Fewkes is of the opinion that the structure was intended for religious and not domiciliary purposes

2 BALCONY HOUSE, MESA VERDE NATIONAL PARK, SOUTHWESTERN COLORADO

This ruin is the third in size of the numerous prehistoric ruins on the Mesa, and one of the most interesting and most spectacularly situated. Two kivas, or underground ceremonial chambers, are shown in the foreground

distinct from others, a condition that appears in the arrangement of rooms. The rooms occupied by a clan were not necessarily connected, although generally neighboring rooms were distinguished from one another by their uses. Thus, each clan had its men's rooms, which was ceremonially called the "kiva." Here the men of the clan practically lived, engaged in their occupations. Each clan had also one or more rooms, which may be styled the living rooms, and other enclosures, for granaries or storage of corn. The corn was ground into meal in another room containing the *metate* set in a bin or stone box, and in some instances in fireplaces, although these were generally placed in the plazas or on the housetops. All these different rooms, taken together, constitute the houses that belonged to one clan.

The conviction that each kiva denotes a distinct social unit, as a clan or a family, is supported by a general similarity in the masonry of the kiva walls and that of adjacent houses ascribed to the same clan. From the number of these rooms it would appear that there were at least 23 social units or clans in Cliff Palace. The kivas were the rooms where the men spent most of the time devoted to ceremonies, councils and other gatherings. In the social conditions prevalent at Cliff Palace the religious fraternity was limited to the men of the clan.

Apparently there is no uniformity in the distribution of the kivas. As it was prescribed that these rooms should be subterranean, the greatest number were placed in front of the rectangular buildings, where it was easiest to excavate them. But when necessary these structures were built far back in the cave and enclosed by a double wall, the intervals between whose sections were filled with earth or rubble to raise it to the level of the kiva roof. In that way they were artificially made subterranean, as the ritual required. Easily reached from Denver and Colorado Springs, Mancos on the Rio Grande Southern Railroad is the preferable starting point by stage or automobile to explore the mesa. Consult United States Department of Interior Bulletins 'The Mesa Verde National Park' (Washington, D. C., 1915); Nordenskjold, B., 'The Cliff Dwellers of the Mesa Verde' (Stockholm 1893).

MESABI RANGE. See IRON ORE — *Iron Ore Districts.*

MESCAL, a fiery liquor produced in Mexico from several species of Agave (q.v.). The most famous liquor, however, is made from the "hearts" of the species *Agave tequileana.* The city of Tequila, in the state of Jalisco, is the centre of this particular industry. The Tequila Agave resembles in the appearance of its stiff lance-like leaves the sisal hemp plant, though it sends out its leaves from a great bulb-like cellular mass which forms the heart of the plant. This heart, when denuded from its leaves and detached from the root, is cleft in two, and a dozen of these pieces make a fair load for a mule, for they must be transported from the fields where grown to the city, sometimes a journey of several miles. These hearts are roasted in pits, within the distillery enclosures, dug four or five feet deep and considerably wider. A hot fire is built of mesquite wood, and large stones distributed through the fuel. The "heads" are then heaped over the burning mass until a huge mound is formed, which is covered first with grass and then with earth, and the mass left several days to cook. When the mound is opened the raw product is found to have changed to a dull brown in color, and the juices to have been converted into sugar. White hot and steaming, the mass is taken to another pit, stone-paved, on the bottom of which revolves a heavy stone crusher, really an arrester operated by mule power. Here it is ground into pulp and the semi-liquid mass carried in deep trays on the heads of Indians to the vats where it remains to ferment. Then it goes to the rude stills, and is run off as mescal. The commercial mescal is a colorless liquor sometimes with a slight amber tint, though much of it is like alcohol. Some of the higher grades are given fancy names which serve as trademarks. It is far too strong a liquor to be drunk with impunity, though its fiery quality seems to suit the Mexican taste for hot things. Zotol is another liquor, made in the same way from the bulb-like heart of a species of *Dasylirion,* which is said to be as strong as 95 per cent alcohol. These liquors should not be confounded with aguardiente, which is made from sugarcane. The Mexican name means burning water.

MESCALA. See MEXCALA.

MESCALEROS (Spanish, mescal, a native drink used in Mexico, Guatemala, and along the southern boundary of the United States), an Apache tribe so called because of their love of mescal. Somewhat of a nomadic character, they covered territory, at times, between the Rio Grande and the Pecos in New Mexico and southward into Mexico. They gave the governments of the United States and Mexico trouble, from time to time, but not so much as their relatives in Arizona and northern Mexico. In 1873 a reservation of 475,000 acres was set apart for the use of the Mescaleros in Southern New Mexico. The tribe now numbers about 500.

MESDAG, měs'dăg, **Hendrik Willem,** Dutch marine painter: b. Groningen, 23 Feb. 1831. He was a banker, following in his father's footsteps, until his 36th year, when he devoted himself to art, studied under Alma Tadema, who was a relative, and under Roelofs, and lived at The Hague, with a studio at Scheveningen. He takes a foremost rank among modern painters of the sea, and conveys the idea of water-masses and motions very felicitously. The report circulated in American newspapers of his death 4 Aug. 1902 was false. Mesdag's pictures include 'Fishing Boats at Scheveningen,' 'Strand of Scheveningen,' 'Morning on the Scheldt,' 'In Peril,' and many other views of the North Sea. Consult Zilken, 'H. W. Mesdag' (English version by Bell, 1896); and Marius, 'Dutch Painting of the Nineteenth Century' (1908).

MESENTERY, a double fold of the peritoneum which attaches the small intestine to the spinal column, but in such a manner as to permit great freedom of motion. The corresponding support of the large intestine is the mesocolon, with the mesorectum. The mesentery contains between its folds several blood-vessels, lacteals, lymphatics, nerves, and the ganglia called mesenteric glands, which are connected with the lymphatico-lacteal system.

It is about four inches wide, and extends nearly the whole length of the intestine. It is subject to several diseases, the most frequent of which is tubercular degeneration of some of its numerous glands. For this and other diseases of the mesentery, see PERITONITIS.

MESHA, king of Moab mentioned in II Kings iii, 2–27. This monarch threw off the yoke of Israel, then ruled by Ahab and the latter's sons, Ahaziah and Jehoram. Later Jehoram, with the aid of the kings of Judah and Edom, defeated Mesha and his hosts. Mesha was defeated and besieged in Kir-hareseth, but managed to hold out against his enemies although his country was overrun. See MOABITE STONE.

MESHED, mĕsh'ĕd, or **MESHHED,** mĕsh'-hĕd, Persia, capital of the province of Khorasan, in an extensive valley 500 miles northeast of Ispahan. It is surrounded by walls, and has many ruinous houses, but its principal street is spacious and handsome, having a water-course, the banks of which are shaded by trees, passing through it, while at its extremity are seen the splendid cupola and gilded minarets of the mosque containing the shrine of Iman Riza, the son of Ali, the founder of the Shiites. This tomb has a gorgeous interior, a vast hall, like the central nave of a cathedral, rising loftily into a central dome ornamented with the richest colors and a profusion of gilding. This shrine attracts a vast number of pilgrims. Here also is the mosque of Gohur Shah, considered one of the most beautiful and splendid in Persia. The chief manufactures are velvets, sword-blades and some silk and cotton goods. A considerable number of the inhabitants are employed in cutting the turquoises obtained in the vicinity. The situation of Meshed on several great caravan routes makes it an important entrepôt for the produce of surrounding countries. The customs receipts for the territory approximated $250,000 annually up to 1914, but fell off nearly one-half during the World War. Pop. about 61,500.

MESHTROVITCH, Ivan, Jugoslav sculptor: b. Otavice, Northern Dalmatia, 1883, the son of a Croat. He was educated at the Vienna Academy of Arts and first exhibited his work in that city in 1902, and in 1911 his studies for the Serbian National Temple at Kossovo were shown in Rome. An artist of the highest type, endowed with astonishing ability, he is regarded in Europe — especially in England — as one of the greatest sculptors that ever lived. In 1915 a representative committee brought him to London and organized an exhibition of his works at the Victoria and Albert Museum. Art, political idealism, mythology and religious mysticism are inseparably bound up in his creations. His remarkable talent is expressed in the eclectic variety of styles of which he is master; it would seem that all known styles culminate in Meshtrovitch: Egyptian, Greek, Baroque, Byzantine, Assyrian and the most violently realistic modernism. Consult 'Ivan Meštrovič: A Monograph' (London 1919), by Sir John Lavery, Dr. Seton-Watson and others, with 68 photographic plates.

MESMER, Friedrich (or **Franz**) **Anton,** frĕd'riç ăn'tŏn mĕs'mĕr, German physician: b. Itzmang, near Constance, Baden, 23 May 1733; d. Meersburg, Baden, 5 March 1815. He was educated in medicine by Van Swieten at De Haen of the University of Vienna, made some study of astrology, came to believe in the influence of the stars, and attributed this supposed influence to magnetism. Having at first believed in the cure of diseased bodies by the use of magnets, he came wholly to discard the magnets and declared that an occult force, which he called animal magnetism, pervading the universe, resided in himself and afforded him an influence over others. In 1778 he went to Paris and set the town astir. He had undoubtedly an honest belief in the efficacy of his discoveries but he took advantage of popular interest to enshroud his methods with mystery. Finally the government appointed a committee of noted physicians and members of the Academy of Sciences, including Benjamin Franklin, to investigate the matter; and the committee in a report, admitting many facts but attributing them to physiological causes and not to any such supposed agency as animal magnetism, so discredited Mesmer that he went to London, and later to Germany. The name mesmerism was formerly applied to the entire class of phenomena now known as hypnotism (q.v.). It is now claimed that there is a force in the human body generally called magnetiscor, which is under the control of the human will, and that when the control of this force passes to another hypnotism occurs. Among his writings are 'Mémoires sur la Découverte du Magnétisme Animal' (1779); 'Histoire Abrégée du Magnétisme Animal' (1783); and the 'Mémoire de F. A. Mesmer sur ses Découvertes' (1799). See ANIMAL MAGNETISM; HYPNOTISM.

MESMERISM. See HYPNOTISM.

MESNE (mēn) **PROCESS,** *in law,* an intermediate process which issues pending the suit upon some collateral interlocutory matter. Sometimes it is put in contradistinction to primary and final process, or process of execution, and then it signifies all such processes as intervene between the beginning and end of a suit.

MESODERM. See ANATOMY, COMPARATIVE; EMBRYOLOGY.

MESOHIPPUS. See HORSE, EVOLUTION OF THE.

MESONERO ROMANOS, mā-sō-nā'rō-mā'nōs, **Ramon,** Spanish writer: b. Madrid, 1803; d. 1882. After a short time spent in mercantile life he turned to journalism, and after some time spent on the Madrid *Press* he founded the *Semanario Pintoresco Español,* which he continued to edit and manage until 1842. Mesonero was a great lover of his native city which, in his youth, was still the old-fashioned Spanish capital teeming with true native life, before it had begun to reflect the fashions, customs and manners of Paris. He rubbed elbows with his fellow city-dwellers everywhere and on every occasion; and out of this intimacy sprang interesting and well-written sketches of popular types, manners and customs. His comprehensive knowledge of his native city appears in 'Manual de Madrid' 'Escenas Matritenses' (2 vols., 1836); 'Memorias de un setentón' (1880), and 'El Antigno Madrid.' Mesonero is one of the masters of modern Spanish. His language is ever graceful, tending to a slight diffuseness, but always preserving its purity and idiomatic

complexion and force. A collected edition of his works was published in Madrid in 1881 under the title 'Obras completas de Ramón Mesonero Romanos.' In 1903–05 two volumes more of his hitherto unpublished writings also appeared in Madrid. Consult for biographical sketch, Northup, G. T., 'Selections from Mesonero Romanos' (New York 1913).

MESONYCHIDÆ, a family of Creodonts, prevailingly North American, which were more highly specialized than any other. They acquired a wolf-like form, with a very long slender tail, and legs and feet digitigrade gait indicating powers of speed beyond those of any other creodont. Their heads, however, were disproportionately large and bear-like. The general structure, nevertheless, shows that they could not have been rapid and aggressive in their habits, and their teeth suggest that they lived principally on vegetable diet. Their development into hyenalike creatures may be traced to nearly the close of the Eocene.

MESONYX, a primitive carnivorous animal of the group *Creodonta* (q.v.), which must have resembled in external aspects, when alive, the modern Tasmanian wolf of Australia. Its remains are found fossil in the fresh-water formations of Eocene Age along the eastern base of the Rocky Mountains, and a complete skeleton is mounted in the museum of Princeton University, and a restoration is exhibited in the American Museum of Natural History in New York. This specimen (*Mesonyx obtusidens*) indicates an animal as large as a Saint Bernard dog, with its hindquarters drooped somewhat, like those of a hyena and a very long, slender tail. It is the type of a large family (*Mesonychidæ*) of wolf-like beasts widely distributed in Eocene time. Consult Woodward, 'Vertebrate Palæontology' (London 1898); Osborn, 'Age of Mammals' (New York 1910).

MESOPHYTE (Gr. "mid-grower"), *in botany and forestry,* a term used of plants which grow naturally in soil of moderate moisture. Thus the term is contrasted on the one hand with xerophyte, "dry-grower," and hydrophyte, "wet-grower," these latter terms being applied to plants requiring very little or very much moisture. Since soil of moderate moisture varies from moist to dry, whereas both the dryer and wetter soils are comparatively invariable in this respect, it naturally follows that Mesophytic plants show more adaptability to conditions of moisture than either hydrophytes or xerophytes. For the same reason, no doubt, the mesophytic flora, being comparatively stronger, is denser and marked by much wider variations of species, than the scanty and monotonous growths of poorer, because of wetter or dryer, soils.

MESOPOTAMIA, from Greek *mesos,* middle, and *potamós,* river: a geographical term applied to the territory lying between the Euphrates and Tigris in Western Asia. The Arabs call those rivers El-Frat and Shatt respectively; the latter is also called Ed-Dijleh in its lower course. The boundaries of this region (which forms no single political division) are not very definite; roughly speaking, it includes all (Turkish) territory south of Diarbekr and running parallel with the Persian frontier down to the gulf. As regarded by geographers, it is bounded on the north by the Armenian Taurus, on the east by the Iranian frontier mountains, on the south and west by the Syrian Steppes, and the Persian Gulf on the southeast. The territory is divided into the three vilayets of Mosûl, 35,130 square miles; Bagdad, 54,540 square miles; and Basra, 53,580 square miles; total, 143,250 square miles. The population of Mesopotamia is generally stated to be about 2,000,000, but competent observers consider 1,300,000 to be nearer the mark. The country to which the name properly applies as extending between the two rivers has a gradual fall of nearly 1,000 feet from the spurs of the Taurus range to an old coastline south of Hit, whence an almost unbroken plain stretches to the Persian Gulf. The natives give the name of El Jezireh (the island) to the upper or northwestern portion, and that of Irâk Arabi (the ancient Babylon) to the lower or southeastern section. This latter, indeed, is often excluded as being beyond the confines of Mesopotamia proper. Low ranges of hills break the great plain of Upper Mesopotamia; between them the Khabur and its tributaries flow to the Euphrates, through a desolate region that was once thickly populated. The mountain district bordering the plain and stretching to the Persian frontier forms part of "Kurdistan," a mere name that has no concrete geographical existence, being mostly comprised in the vilayet of Diarbekr and belonging mainly to Mesopotamia. Ethnically it includes the Kurdish and the Arab nomad tribes — respectively of Iranian and Semitic stock. Upper Mesopotamia is rich in grain, wine and pasturage; the lower is flat, dry and unfruitful. Between the Khabur and the Euphrates lies the Biblical *Aram-Naharaim,* or Syria of the Two Waters, also called *Padan-Aram,* or Syria of the Plain. It is mentioned in the Old Testament in connection with Isaac and Jacob (Gen. 24 and 27). The Greek title was probably not in use till after Alexander the Great invaded the East. The soil consists of a sandy clay of excellent agricultural properties; only where water fails is it incapable of cultivation. Its remarkable fertility is shown by the fact that it still remains unexhausted after having supported through many centuries the Assyrian, Babylonian and Persian empires. The number and vastness of the ruins that lie scattered over this region from Babylon to Nineveh still bear silent testimony to its former flourishing condition. Since the cuneiform inscriptions gathered from these ruins have yielded up their secret to the researches of modern science, we have learnt with certainty that the plains of Mesopotamia were the scenes of successive civilizations, rivaled in splendor and antiquity only by those of ancient Egypt. To-day, in certain localities, may be found lions, leopards, wild asses, boars and gazelles.

Mesopotamia is essentially a land of origins; so far as we know it cradled the human race and nurtured it for centuries until a new era was introduced by the Flood incidents, which are recorded not only in the Hebrew Scriptures, but also in the cuneiform inscriptions. Its early history is one of constant struggles for supremacy between contending nations. Mesopotamia and its adjacent plains have been associated with some of the most important turning-points of human history; for milleniums

these lands contained the capitals of great world-empires and have been closely connected with the most thrilling epochs of history. Even in the World War of 1914–18, Mesopotamia — by reason of the Bagdad Railway schemes — played a rôle the importance of which is as yet but inadequately recognized, for that railroad was the keystone in the German aspirations toward a world-empire. The Mesopotamians sprang from the Chaldæans, the primitive inhabitants; from the Cushites, who in the reign of Nimrod built the cities of Edessa and Nisibis; and from the descendants of Shem, of the tribe of Thara. The Hebrew race took its rise from this land when Abraham came from Ur of the Chaldees and settled in Canaan. It was also in this plain of Shinar that the confusion of tongues occurred. Babylonia was the mother of astronomy, and the 12 divisions on the dials of our clocks originated there, while the influence of Hammurabi's famous laws has penetrated down the ages into the legal codes of modern times through the intricate systems of Greek and Roman legislators. Mesopotamia was originally a part of Nimrod's dominions, the founder of Calneh or Nippur. After an interval of more than 700 years (2000 B.C.) Cushan Rishathaim reigned in Mesopotamia, who extended his territory over the Euphrates. The Israelites, who then possessed Palestine, were compelled to pay him tribute for the space of eight years. In the Golden Age of the Assyrian power (790 B.C.) Mesopotamia was entirely subjected to that empire, and suffered the fate of its subsequent conquerors. Trajan brought it under Roman dominion in 106 A.D., but the Persians did not permit the Romans to remain long in undisturbed possession, for it was a constant cause of war between the Roman and Persian empires, and at last Jovian surrendered it to the Persians in 363 A.D. When the Arabs in 651 established a new empire upon the ruins of the Sassanide kingdom, Mesopotamia was also obliged to submit to the storm. In 1040 it fell into the hands of the Seljuks. From that time it had many rulers in rapid succession. Genghiz Khan made himself master of it in 1218, but in 1360 it fell into the hands of Tur Ali Bey. Timur conquered it 40 years later, and in 1514 it was incorporated in the Persian Empire under Ismael Sophi. In 1554, however, the Persians were compelled to surrender more than half of it to the Turks; and though they again recovered the lost portion in 1613, they were unable to withstand the attacks of Amurath IV, who united this in 1637, with many other provinces, to his empire. Despite its vicissitudes and the wars fought on its soil, the country remained rich and prosperous until the battle of Kadisia (635 A.D.) placed it at the mercy of the Arabs. Assyria and Babylonia were the wealthiest countries of antiquity, and Mesopotamia was the richest part of the great Persian Empire. In olden times Babylonia was perfectly irrigated, but the wonderful system of canals fell into ruins under the Turks. As the nomads pressed forward the peasants were driven from their lands, and the great irrigation works were neglected, and the Euphrates, no longer controlled, spread out into wide fever-bearing marshes. The work of devastation commenced by the Arabs was completed by Tartars, Mongols and Turks, with the result that one of the most fertile regions in the world became practically a desert abandoned to nomads. Arabs now form the majority of the population, though the original inhabitants are still represented by Kurds, Yezidis or "devil worshipers," Nestorians, Chaldæans or Roman Catholic Aramœans and Jacobites in the north; and by Salians in the south. There are about 80,000 Arabic-speaking Jews resident in Mesopotamia who guard with reverence the traditional tombs of Joshua near Bagdad, of the prophet Ezekiel near the banks of the Euphrates, and of Ezra the Scribe on the Tigris near Kurnah. Besides its wealth of biblical associations, Mesopotamia is a land of sacred memories to hundreds of millions of Mohammedans. Two gilded domes on the splendid mosque at Kazmain cover the tombs of eminent teachers; this and the mosque at Samarra are Shiah shrines. A mile away, on the left bank of the Tigris, is the stately Hanifi mosque of the Sunnis at Muaththam, and the famous mosque of Abd ul Kadir is in Bagdad. The tomb of Mohammed's barber, Salman Pàk, is near the ruined arch of Ctesiphon. The holy Mohammedan cities of Kerbela and Nejif are near the banks of the Euphrates, to which thousands of embalmed corpses are brought by pilgrims every year from India and Persia for interment. Under the blighting misrule of the Turk Mesopotamia has become one of the most desolate countries on earth, swarming with vermin and insects. What little manufacture is carried on is used for home consumption. Sugar, cloth, coffee, iron, indigo and copper are imported; the chief exports are dates, wool, cereals, gum, rice and hides. The foreign trade is mainly with Great Britain, India and Persia. Passengers and merchandise are carried down the Tigris from Diarbekr to Bagdad on rafts of inflated sheepskins. Sailing boats are used below Samara, while from Bagdad to Basra on the gulf river steamers ply. Steamers can navigate the Euphrates as far up as Meskineh. The principal towns are Diarbekr, Urfa (Edessa), Harran, Mosûl and Bagdad. Basra, on the Shatt el-Arab (the confluence of the Tigris and Euphrates from Kurna) is the port of transhipment from river to ocean craft. Mesopotamia has the evil reputation of being the home of the bubonic plague, and British mission doctors have labored there for many years to grapple with that disease and the deadly cholera.

Mesopotamia and the War.— It has already been mentioned thaat Mesopotamia was the keystone of the Pan-German scheme by reason of the Bagdad Railway. According to German authorities on the subject, there were three alternative plans to promote the expansion of Germany into a great world-empire. In the early stages of the Pan-German movement, the vision of its advocates was fixed upon South America as the most promising territory upon which a Greater Germany might be built. Here, however, the Monroe Doctrine stood in the way. The British Empire, as the largest landholder in the world, then became the focus of the Pan-Germanists, and here, again, a formidable barrier stood in the path — the British navy. Two avenues being thus barred by obstacles which could only be removed by an overwhelmingly powerful fleet, a third plan presented itself, a plan which provided for an

overland expansion where no Monroe Doctrine existed and no British navy could intervene. The scheme was to gain control of the Balkan peninsula by the elimination of Serbia, the only hostile barrier separating the Central Powers from a friendly power, Bulgaria. This accomplished, the road lay open to Constantinople, a junction which, in its turn, opened the door to Asia, via the Persian Gulf; to East Africa and Australia. The principal artery of communication lay in Mesopotamia — the Bagdad Railway. It was calculated that this project could be carried out without coming into physical contact with either British territory or navy, and would place Germany in a position eventually to strike both at India and Egypt, a variation of Napoleon's plan of campaign for breaking the power of Britain. According to Prince Bülow, former German chancellor, this undertaking "threw open to German influence and German enterprise a field of activity between the Mediterranean Sea and the Persian Gulf, on the rivers Euphrates and Tigris, and along their banks. If one can speak of boundless prospects anywhere, it is in Mesopotamia" ('Imperial Germany,' p. 116). These words were no exaggeration, for Sir William Willcocks, an English engineer who had surveyed the country and planned a gigantic system of irrigation, part of which he had carried out before the war, had said, in 1903, that "Of all the regions of the earth, no region is more favored by nature for the production of cereals than the lands on the Tigris." This authority stated that the irrigable area of Mesopotamia was from two to three times as large as that of Egypt, which leads to the presumption that the country could support some 30,000,000 people. Persia and Turkey being decrepit and moribund states, the Pan-Germanists saw in Mesopotamia a field for exploitation which would make it for Germany what Egypt was to Great Britain or Morocco to France. German professors had painted the possibilities of this region to enthusiastic audiences in glowing colors, and had not omitted to point out that a German foothold on the Persian Gulf would imperil the position of Great Britain in India and Egypt. Now the most important route of the British Empire is the sea-route from England to India and Australia via the Suez Canal. The value of the Persian Gulf as a strategical British position has been pointed out by Admiral Mahan, on account of the Red Sea being merely a continuation of the Suez Canal, both of which could be dominated by a hostile power holding the gulf. The British, however, have not awakened to the importance of the gulf only in recent years, for already in the days of Queen Elizabeth it was visited by English vessels; before ever the Turkish crescent appeared on the shore of Arabia the English flag was known and respected in the Persian Gulf. The East India Company planted a depôt at Bandar Abbas in its early days and for nearly two centuries fought with Dutch and Portuguese rivals. The Anglo-Indian navy first surveyed the gulf and provided for its lighting to guide navigation. For 50 years the British hunted the pirates in the gulf and destroyed their strongholds. Altogether, for 300 years the British have been the guardians of the gulf, by protecting Persia, suppressing gun-running and slavery, fighting the plague and introducing the elements of sanitation among the natives on the coastline. All that Great Britain took in return was a spot on an island for a telegraph station; but she allowed no compromise on one point — that no power should be permitted to seize territory and no other flag should dominate those waters: The future of India and of the empire was bound up with British prestige in the Persian Gulf. These considerations explain the suspicion and mistrust of Great Britain regarding the absorption of Mesopotamia by Germany — an avowedly hostile power. In 1899 a German company obtained a concession from the Sultan to build a railroad from Konieh — the terminal of the Anatolian Railway — to Bagdad and Basra on the Persian Gulf, and from that year dates the German penetration of Mesopotamia. On realizing the political objects underlying the scheme, Great Britain protested and a diplomatic conflict began which was still in progress when the war broke out. During 1913–14 a strange medley of diplomatic negotiations were being held on the question of Mesopotamia and the railway, in which England, France, Russia, Germany and Turkey were involved, with the result that Germany obtained the acquiescence of the powers to be the sole *concessionnaire* of the railroad, though England forced Germany and Turkey to fix the terminal well inland at Basra. The lighting, marking and policing of the gulf by England was confirmed by Turkey. Meanwhile, Russian diplomacy had succeeded in creating intangible "spheres of influence" in Turkish territory by which the German railroad through Mesopotamia was hemmed in on either side, while Great Britain held the key of the exit. As compensation for being restricted at that exit, Germany received a concession to build a line from the Bagdad Railway to Alexandretta on the Mediterranean. At a later date Great Britain was apparently willing to grant an extension of the German sphere, for Prince Lichnowsky (q.v.) records in his famous Memorandum that "the greatest concession Sir Edward Grey made to me personally was the continuation of the line to Basra. We had not insisted on this terminus in order to establish connection with Alexandretta. Hitherto Bagdad had been the terminus of the line. The shipping on the Shattel-Arab was to be in the hands of an international commission. We also obtained a share in the harbor works at Basra and even acquired shipping rights on the Tigris, hitherto the monopoly of the firm of Lynch." He goes on to say that "by this treaty the whole of Mesopotamia became our zone of interest. . . ." This treaty, of course, was neither signed nor published owing to the outbreak of the war, otherwise the ex-ambassador remarks, "an agreement would have been reached with England which would have finally ended all doubt of the possibility of an Anglo-German co-operation." See WAR, EUROPEAN: TURKISH CAMPAIGN.

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MESOZOIC ERA, *in geology,* the mid-period of life in geologic time, also called the Secondary Period. Paleozoic precedes and Cenozoic follows this era, these two terms referring respectively to "older" and "newer," or "earlier" and "later," forms of prehistoric life. The subdivisions of the Mesozoic are the Triassic, Jurassic and Cretaceous periods (qq.v.).

The Life of the Mesozoic.—The life history of the era can be best understood, by first referring to the life of the Paleozoic (q.v.). That era was closed under conditions (aridity, glaciation and mountain making) unfavorable to plant and animal life, and as a result many unfit genera failed to live from Paleozoic on into Mesozoic. The long-hinged brachiopods, so characteristic of the earlier era, became extinct early in the latter. A few of the more primitive types persisted, but brachiopods became relatively unimportant. The old straight cephalopods practically became extinct with the passing of the Paleozoic. The nautilus type lived on through, even to the present time, but the era was characterized particularly by the dominance of a type called the ammonites, which appeared in late Paleozoic and died out at the close of the Cretaceous. They evolved rapidly and are valuable time markers. The Mesozoic has often been called the age of reptiles. This group of vertebrates, which appeared toward the close of the Paleozoic, in primitive form, developed rapidly into a number of highly specialized types. The Dinosaurs (terrible reptiles) developed along several lines. The carnivorous group walked on two legs, the two front limbs being very short. It was this reptile that made the famous three-toed tracks of the Connecticut Valley. Some of these Dinosaurs got to be as long as 40 feet. Herbivorous types also developed, great awkward beasts, some of them 80 feet long, 16 feet high and weighing probably 30 tons or more. This type were the largest land animals that ever lived. Late in the era peculiar armored Dinosaurs also appeared, with great horns on their heads and spikes on their tails. The Ichthyosaurs (fish reptiles) took to the sea and developed fins, much after the manner of modern fish. The Pterosaur (wing reptiles) developed the power of flight, some of them having a wing spread of 20 feet. These unusual reptiles all died off suddenly at the close of the Cretaceous, and in the following era reptiles took on a modern aspect. Peculiar birds with teeth, the first known representatives of the feathered world, are found fossil in Jurassic and Cretaceous rocks. A few primitive mammals, mostly of very small size, are known in the Mesozoic, but the group did not develop rapidly until after the close of this era. Among plants the common groups of flowering plants did not appear until Cretaceous times.

Paleogeography of the Mesozoic in United States.— During Triassic and Jurassic times practically all of the United States east of the Mississippi was land. During Cretaceous times sea encroached on the coastal plain but did not reach the eastern interior region. The history of the west was more complex. During the Triassic a considerable part of the Pacific Coast region was under water but most of the interior was land. Similar conditions prevailed during early Jurassic, but late in the period a great arm of the sea encroached from the Arctic, reaching as far south as northern Colorado. The great differences in fossils seem to indicate that this bay was not connected with the Pacific directly. This arm of the sea withdrew before the end of the period which was marked in California and Oregon by great folding and intrusions of igneous rock making the mountain ranges known as the Sierra Nevada and Cascades. In the west the Upper Cretaceous was marked by a great inland sea, over the site of the Great Plains and Rocky Mountains, reaching from the Gulf of Mexico to the Arctic Ocean. Toward the close of the period this sea retreated, leaving great swamps in which coal was formed. The era was brought to a close by a great period of folding known as the Lanamide Revolution which uplifted the Rocky Mountain Range.

MESQUITA, mās-kē'tā, **Salvador** a Brazilian poet: b. Rio de Janeiro, 1646; d. Rome, in the early 18th century. He went to Rome, where he entered holy orders and became well known for his Latin scholarship. His 'Sacrificium Jephthæ' (1680), a sacred drama, established his poetic fame among contemporaries. His tragedies from profane history, 'Demetrius,' 'Perseus' and 'Prasias Bithynus,' all appearing at Rome between 1690 and 1700, also had once high rank.

MESQUITE, a tree or shrub (*Prosopis glandulosa* and *P. juliflora*) of the family *Mimosaceæ.* Several species of mesquite are very common in the southwestern United States from Texas to California, extending southward through Mexico and tropical America. In the United States they are usually shrubs, but farther south large trees. The branches are armed with spine, the leaves compound of numerous leaflets, the flowers small and greenish, in spikes, and the fruit of long indehiscent pods. In the arid southwest the mesquite is often the only source of firewood which is not obtained from the branches, but from the very large roots. The pods are eaten by cattle, and sometimes by people, for their sweet pulp and seeds. The screw-pod mesquite or tornillo is *Prosopis pubescens,* another southwestern plant, whose pods are coiled in a tight spiral, resembling a screw.

MESS, in the army and navy, and particularly the latter, a company of officers, or crew of a ship, who eat, drink and associate together; in military language, a sort of military

ordinary, established and regulated by the rules of the service, for all the officers in a regiment, and supported by their joint subscriptions, supplemented by a small government allowance. Similar institutions are extended to the non-commissioned officers of a regiment. The enlisted men mess by companies as a rule, but often it is desirable to cut the company into squads for mess purposes. The post commander usually appoints some officer to take charge of mess arrangements. In active service the officers are apt to mess with their own troops, but in camps they have their separate mess. In the navy it is usually convenient to have a captain's mess, another for the wardroom officers, another for the junior officers, another for the warrant officers, etc. The men's mess for the sailors or marines is styled the "general mess," but this is usually divided into sections, as a matter of convenience. It has become common to employ ammunition passers as mess attendants.

MESSAGER, André Charles, French composer: b. Montluçon, 30 Dec. 1853. He received his musical education at École Niedermeyer, Paris, and subsequently studied under Saint-Saëns in the same city. He was appointed organist at Saint Sulpice in 1874. A symphony of his won the gold medal of the Société des Compositeurs in 1876. In 1880 Messager became music director at Sainte Marie-des-Batignolles. Three years later he completed the comic opera by Bernicat, 'François des bas bleus,' and in 1885 produced his own operettas, 'La Fauvette du temple' and 'La Béarnaise.' The following year saw the production of his ballet, 'Les deux pigeons' at the Opéra. Messager's reputation, however, was most enhanced by the comic opera 'La Basoche,' produced at the Opéra Comique in 1890 and in English in London in 1891. It was followed by the operas 'Madame Chrysanthème' (1893); 'Mirette' (1894); 'Les petites Michus' (1897) and 'Véronique' (1898); 'Les dragons de l'impératrice' (1905); 'Fortunio' (1907); 'Béatrice' (1914). Messager became conductor at the Opéra Comique in 1898; was one of the directors of the Covent Garden Opera in 1901–07, and first conductor at the Paris Grand Opéra after 1907. From 1907 to 1914 he was also joint director with Broussan of the Grand Opéra and after 1908 was conductor of the Concerts du Conservatoire.

MESSALA (mĕ-sā'lą) **CORVINUS, Marcus Valerius,** Roman soldier, orator and writer: b. about 65 B.C.; d. about 2 B.C. He received a part of his education in Athens, returned to Rome before the second triumvirate and joined the Senatorial party. He fought with Brutus and Cassius at Philippi, 42 B.C., and afterward attached himself successively to Antony and Octavius, served at the battle of Actium, 31 B.C., and the same year was chosen consul. He subdued Aquitania, of which he was made proconsul and was honored with a triumph. For a time he was a prefect of Rome and held the office of augur. Messala was the friend of Horace and other distinguished men of the age, a zealous patron of literature and art, notably of the poet Tibullus, and one of the most eminent of Roman orators.

MESSALINA, mĕs-ą-lī'ną, **Valeria,** Roman empress. She married Claudius (later emperor) in 38 A.D.; bore him a daughter, Octavia, and a son, Britannicus; proved herself vicious, licentious and vulgar by her many open amours; and in her husband's absence formally married Gaius Silius, whom she attempted to make emperor. Claudius refused or delayed to punish her, and Narcissus, the emperor's favorite, had her put to death (whether with Claudius' knowledge or not is not known) in 48 A.D. Her reputation was whitewashed in Stahr's 'Agrippina, die Mutter Neros' (1880).

MESSENE, mĕ-sē'nē, the capital of Messenia in Peloponnesus, founded by Epaminondas (369 B.C.) after his victory of Leuctra over the Lacedæmonians, and situated at the foot of the hill of Ithome, the fortress of which formed the acropolis of the new capital. The latter was surrounded by massive stone walls, flanked with towers, of which there are still considerable remains at the modern village of Mavromati. The Greek Archæological Society, in 1895, excavated a colonnade and other parts of the ancient agora. Messene with its acropolis was, next to Corinth, the strongest city of Peloponnesus. It was supplied with water from a fountain called Clepsydra, the spring of which still exists.

MESSENIA, mĕ'sē'nĭ-ą, Greece, a nomarchy in the western part of Morea (Peloponnesus), bounded on the north by Elis and Achaia and Arcadia, on the east by Arcadia and Laconia, on the south and west by the Ionian Sea. The greater part of the surface is a fertile plain, but there are mountainous lands in the east and northeast. Kalamata, the capital, is in the southeast on the Gulf of Koron (Messenian Gulf). When Messenia was a state of ancient Greece its chief cities were Methone and Pylos (Navarino). Later Messene (Mavromati) was the capital, and the strong mountain fortress was Ithome. A ridge of Mount Taygetus separated Messenia from Sparta. Messenia is celebrated for the long struggle of the inhabitants with the Lacedæmonians in defense of their liberty. In the first Messenian War (743–723 B.C.) the Lacedæmonians, with the Athenians, invaded Messenia. For 20 years the Messenians defended themselves valiantly under their king Aristodemus, who in consequence of an answer of the Delphic oracle which promised them the victory on condition of the sacrifice of a virgin of the royal family, offered his own daughter as the victim. Her lover, to save her life, declared her to be pregnant by himself; and Aristodemus, to prove her innocence, stabbed her with his own hand, and caused her to be opened and sacrificed. The Messenians, though for some time successful, were finally obliged to submit by the loss of Ithome. About 40 years after they again rose, and thus commenced the second Messenian War (685 B.C.), which ended in their entire subjugation. A part of the Messenians emigrated to Sicily, and there founded Messana (see MESSINA) on the site of the ancient Zancle (668 B.C.). Those who remained were reduced to the state of helots. After 200 years of servitude they again took up arms. This third Messenian War lasted 10 years (465–455 B.C.), and resulted in the expulsion of the Messenians from the Peloponnesus. Epaminondas restored them, gathering together the exiles from the various lands

in which they were scattered. Within the space of 85 days they completed and fortified Messene (369 B.C.) and maintained their independence till the country was conquered by the Romans (146 B.C.). The Messenians remained true to their customs, manners and language through all changes of fortune.

MESSHED. See MESHED.

MESSIAH, The, is a term which is, in John i, 41, and, in John iv, 25, but without the article, applied to Jesus of Nazareth, as the appointed king of the Kingdom of God. The Greek word which is the translation of the Aramaic term meaning Messiah, namely, χριστός, in English Christ, is used of Jesu in this same sense throughout the New Testament. The word Messiah itself is a modified transcription of the Greek word Μεσσίας. The extract transcription would be Messias, as the word appears in the Authorized Version in both the passages cited above, and the form Messiah is due to the influence of the form of the original Aramaic and Hebrew word. For the word which appears in Greek as Μεσσία was, in Aramaic and Hebrew, מָשִׁיחַ (Mâsî·ḥ). All the forms of the term Messiah, as well as the Greek equivalent, χριστός, and the English Christ, mean Anointed One, and refer to Jesus, when applied to him, as God's Anointed King.

In the Old Testament, מָשִׁיחַ (Mâsî·ḥ) (English Messiah) is used, in a few cases, without the article, and as an adjective, of priests, who were anointed to their office (Lev. iv, 5 and 16, vi, 22). But, in the definite sense of the Anointed One, or the Messiah of Jehovah (the Lord's Anointed), it is used, with a very few possible exceptions, only of kings. Thus, in 1 Sam. ii, 35, it is used of the kings of Israel in general. In 1 Sam. xii, 3 and 5, xxiv, 6 and 10, it is used of Saul; and, in 2 Sam. xiv, 21, xxiii, 1, it is applied to David. In Lam. iv, 20, it denotes Zedekiah, King of Judah; and, in Isa. xlv, 1, it is applied to Cyrus, King of Persia. Two possible exceptions to its use to denote kings may be found in Psa. cv, 15 (quoted in 1 Chron. xvi, 22) and Hab. iii, 13, where it seems to be used to mean the nation of Israel as the priest people of Jehovah, although, even in these cases, it may refer only to the king. In Daniel ix, 25 and 26, it is very difficult to decide the true meaning of this word, because of the great uncertainty in relation to the correct interpretation of these verses. According to the various interpretations which have been given to them this word would mean a high priest, a royal ruler, or that great king of the kingdom of God known to us as Jesus of Nazareth. It is not certain, however, that both times it is used in these verses it has the same meaning. In Psalm ii, 2, the best and most probable interpretation would make the term denote the great coming king known to us as Jesus the Christ. This is the only passage in the Old Testament in which this term can be taken with any reasonable degree of probability to refer to our Saviour.

In the post-canonical literature, the first clear application of the term Messiah to the great coming king of Israel is found in the Psalter of Solomon, dating from about 63 B.C. In this poetical collection we have a full and clear description of this king and his work under this title. There are, indeed, in the Sibylline Oracles and the Book of Enoch, expressions and terms which must be supposed to refer to the coming and expected king of Israel, but the name Messiah is not used in these writings.

While the pre-Christian use of the term Messiah to denote the divinely appointed and eternal king of the Kingdom of God is thus limited, the Old Testament abounds in statements and teachings relating to this king, and that form of the Kingdom of God in which he is to be ruler and sovereign. In some of the passages relating to this final form of the Kingdom of God it is said that Jehovah himself will be the king, as he was, in reality, in all the history of the kindom of Israel. Consult as examples of passages of this kind, Isa. ii, 2–4, Isa. xxxiii, 22, Ezek. xx, 33, Ezek. xxxiv, 15, Zeph. iii, 15, Zech. xiv, 16. In other passages, in harmony with the idea that, while Jehovah was always the real king of Israel, he was represented in the government by a vicegerent king, his anointed on the throne of David at Jerusalem, it is declared that a great and eternal coming king, who, in some of the passages, is stated to be of the line of David, shall reign as king in the final form of the Kingdom of God. Among the passages of this kind may be cited Psa. cx, Isa. ix, 6 and 7, Jer. xxiii, 5–8, Jer. xxx, 8 and 9, Ezek. xxxiv, 23 and 24, Ezek. xxxvii, 24 Hosea iii, 4, Micah v, 2–5, Zech. ix, 9. Just what will be the relation, in person and in nature, between Jehovah and this Davidic king, is not made clear, or even asserted, in the Old Testament.

Independently, therefore, of the use of the term Messiah, there was a natural and sufficient basis in the Old Testament for the widely-spread belief in regard to the coming of a future Davidic king called the Messiah, which appears to have existed in the time of Jesus. In this belief Jesus himself shared, and this king Messiah, or Christ, he both virtually and formally claimed that he himself was. A virtual claim of this kind is found in Matt. xvi, 13–20, and in the parallel passages, Mark viii, 27–30, and Luke ix, 18–21, and also in the act done by Jesus, of which we have the record in Matt. xxi, 1–11, and the parallel passages, Mark xi, 1–10, and Luke xix, 29–40. A formal claim of Jesus to be the Messiah is found in John iv, 25 and 26.

The rejection of the claims of Jesus by the Jewish nation, and the continuation in that nation of the belief in a coming Messiah, were the occasion of the appearance in Jewish history of several who claimed to be the Messiah after the time of Jesus. Of all these the one who was most generally received as the Messiah by the nation, and who accomplished the most for his people, was Simon bar Cochba (or bar Kozeba), who flourished 130–35 A.D., in the reign of the Emperor Hadrian. For two years and a half, bar Cochba reigned as king, and, at the head of an army of 200,000 men, defied the might of Rome. But, in the end, he and his nation were both crushed beneath the power of Rome.

The Jews of the present day are not all of the same opinion in regard to the Messianic hope. The conservative, or Orthodox, Jews are still looking for the coming of the Messiah, the

great king of the line of David. With the liberal, or Reformed, Jews, so far as the term Messiah is used at all, it is made to stand for a personification of a system of ideas and doctrines, and the coming of the Messiah will be the universal acceptance and the world-wide domination of Jewish ideas and the Jewish religion.

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MESSIAH, The ('Der Messias'). Klopstock's 'Messiah' is German Pietism's most important contribution to literature and modern Germany's most pretentious epic poem, consisting of 19,458 dactylic hexameters as compared with the 12,310 of Homer's 'Odyssey.' When the first three cantos appeared in 1748 in the 'Bremer Beiträge ('Bremen Contributions') it took the public a year to get accustomed to the novelty of its form and content, after which its success was unprecedented, its readers awaiting with impatience the next two cantos, which appeared in 1750, and the next five, which appeared in 1755. On these 10 the fame of the work must rest; for the following cantos, appearing five in 1768 and five in 1773, were probably as disappointing then as tiresome now.

The theme is the redemption of mankind, and the poem starts with Christ's entry into Jerusalem on Palm Sunday, the most exalted subject at hand for the young Jena student of theology, who at the academy of Pforta had come under the influence of Milton through the writings of Bodmer. On going to Leipzig in 1747 Klopstock recast the prose beginnings into hexameters, thus breaking with the traditional Alexandrines and loosing a storm of criticism on his head from the school of Gottsched, while that of Bodmer applauded. It has been said that the work of no German poet before Richard Wagner aroused such controversy. Goethe's Autobiography tells us that his father banished the book from the house because of its blank verse. However, Klopstock broke the sway of the French in epic verse as Lessing did later in the drama, demonstrating the nearer affinity of German to English. He learned a great deal from Milton, but his nature was essentially lyrical, contemplative, mystic, and he often smothers the epic possibilities of his subject in a flood of fervent, more or less seraphic, religious ecstasy, which exhausts the reader. Instead of strong contrasts, going from darkness to light, from misery to bliss, he attempts to portray a mental state of continuous, dazzling brilliancy. Instead of an alternation of clashes there is a contemplative passivity, from which result endless repetitions and long drawn out speeches; so to speak, a massive elaboration of the text of Händel's oratorio, which was but seven years older. Certain descriptions, however, are very successful, such as those of hell, the council of the devils, their punishment through transformation, the trips through the universe made by angels and devils, and especially the vision of the last judgment. Klopstock's taking over of the Miltonic cosmography gave him the opportunity of portraying a great struggle between the powers of light and darkness for the soul of Christ and therefore of man, but instead his angels paralyze their adversaries with a look, which method of warfare is not epic, though perhaps pietistic.

His forte is to excite feeling and to lend expression to the inexpressible even when his characters become speechless. No German poet before him had so mastered the capacities of the language, whether in choice of words or in rhythmic cadence. In a sense he became the creator of modern poetic diction. A flood of epic imitations on various biblical subjects attested his contemporary influence, and all the younger poets of his day learned from him, but the 19th century admired him from an ever increasing distance. Edition: 'Werke,' Franz Muncker (Vols. I and II, Stuttgart 1893); 'Messias und Oden' (Halle 1910). Critical: Wilhelm Scherer, 'Geschichte der deutschen Literatur' (12th ed., 1910); Franz Muncker, 'Klopstocks Leben' (Chap. 4, Stuttgart 1893); G. E. Lessing 'Briefe,' XV, 'Brief: Ueber das Heldengedicht: Der Messias' (1753).

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MESSINA, mĕs-sē'nā, Sicily, town and seaport, capital of the province and on the strait of the same name. Messina is walled, flanked by bastions and defended by a citadel on the south and several forts both on the east and west. The harbor is one of the best in the Mediterranean and so much resembles a sickle that the town took its original Greek name from that implement, called *zancle*. Fronting the harbor is a broad quay called the Marina, adorned with statues and fountains and forming a favorite promenade. The streets of the old town are narrow and dirty, but the modern town, built

since the earthquake of 1783, is generally composed of houses of two stories and has spacious streets, well paved with blocks of lava. Among the public edifices are included nearly 50 churches, many of them of great beauty and adorned with fine sculptures and paintings. The cathedral is a Gothic structure, with a somewhat heavy exterior, but supported within by vast pillars of granite, supposed to have belonged to a temple of Neptune. The viceroy's palace, the archiepiscopal palace, the senate house, grand seminary, college, large and well-endowed hospital, numerous convents, two theatres, lazaretto and arsenals are some of the other buildings worthy of notice. The manufactures consist chiefly of silk goods. The trade, both transit and general, is extensive. The principal exports are silks, olive oil, linseed and other seeds, oranges, lemons and other fruits; corn, wine and spirits; salted fish, licorice, lemon-juice, shumac, essences, rags, brimstone, etc. The tunny and other fisheries are carried on to a considerable extent. A destructive earthquake visited the locality 28 Dec. 1908 destroying about half of the buildings and causing the loss of more than 77,000 lives, probably more than half of them residents of Messina. The principal shock was at 5.21 A.M., and the tidal wave that followed, 10 feet in height, swept all before it on the low shore. Notwithstanding this frightful casualty, the city so far recovered that in 1910 the exports were $11,000,000 and the imports about $5,000,000. Messina has a government university, founded in 1549, which had 692 students in 1901. It has departments of law, medicine, science and classics. It has also a naval seminary and a number of elementary schools. Messina, under the name of Zancle, is said to have been founded 1004 B.C.; the Messenians obtained possession 668 B.C.; it became a free city of Rome 241 B.C.; the Saracens captured it in 831; Richard I of England with his crusaders spent six months there in 1191, sacking the town on leaving; from 1282 to 1713 the Spaniards ruled, though the French held it briefly 1676–78; in 1743 a plague killed 40,000 of the inhabitants; in 1783 an earthquake caused large loss of life; in 1854, 15,000 died of the cholera; in 1860 the city came under Italian rule, and was peaceful and prosperous until the 1908 tragedy. The population before the earthquake was 150,000, but in 1911 was reduced to 126,557.

MESSINA, Strait of (Italian, *Faro di Messina;* Latin, *Fretum Siculum*), a channel which separates Sicily from Italy and connects the Tyrrhenian and the Ionian Sea. It has a length of about 20 miles, and gradually widening toward the south, attains, on the parallel of 38°, a width of 11 miles; but in the north, where it is narrowest, does not exceed two miles. The depth is great, in some parts over 4,000 feet, and a strong current continually running with the tide makes the navigation somewhat difficult, but by no means so formidable as was fabled by the ancients, to whom the rock of Scylla, and the whirlpool of Charybdis, on the opposite side, but at some distance to the south, seemed so dangerous that it was generally believed to be almost impossible to avoid the one without being dashed upon the other.

MESSMATES, Animal. See COMMENSALISM.

MESSMER, Sebastian Gebhard, Catholic archbishop of Milwaukee: b. Goldach, Canton Saint Gall, Switzerland, 29 Aug. 1847. Having passed the eight grades of the common school of his home village, he spent three years at the high school in the neighboring town of Rorschach on the Lake of Constance. In 1863 he went to the ecclesiastical preparatory college of Saint George's near the city of Saint Gall, where he finished his classical studies. In 1866 he proceeded to the University of Innsbruck in Tirol to study philosophy and theology and there was ordained to the priesthood, 25 July 1871. In October of the same year he came to Seton Hall College, the diocesan seminary of Newark, N. J., where he taught various theological branches until 1889, when he was called to the chair of canon law at the newly-founded Catholic University at Washington. Before going there he spent the winter of 1889 at Rome, where he attended the lectures of the present Cardinal Giustini on the Justinian or Roman Law, and in June 1891 took the degree of doctor of canon law in the Collegio Appollinare. In November 1891 Dr. Messmer was by the Holy See appointed bishop of Green Bay, Wis. He was consecrated bishop on 27 March 1892, by his life-long friend, Bishop Zardetti, of Saint Cloud, Minn., later Archbishop of Bucharest in Roumania. After the death of Archbishop Katzer of Milwaukee in 1903 Bishop Messmer was appointed Archbishop of Milwaukee where he was installed on 10 Feb. 1904. Dr. Messmer has been a constant contributor of articles to various ecclesiastical periodicals, and has edited a number of smaller works on canon law, catechetics, liturgy and the Bible; also the 'Works of Bishop England D.D.' (7 vols.). With Bishop McFaul of Trenton, N. J., Dr. Messmer, the Bishop of Green Bay, became one of the founders of the Catholic Federation of America in 1901. Since 1916 he has been honorary president of the Catholic Hospital Association of the United States.

MESTIZOS, mĕs-tē'zōs, or **METIS** (Spanish, mixed), half-breeds; those of mixed blood, especially those descended from Indian and Spanish or Indian and Portuguese. In Mexico the European Spaniards are called *Chapetones* or *Gachupines.* See CREOLE.

MÉSZÁROS, Lazar, Hungarian revolutionary soldier and patriot: b. Baja, County of Bács, 20 Feb. 1796; d. Eywood, Herefordshire, England, 16 Nov. 1858. He was first educated for the Church, but subsequently studied law at Pesth. In 1813 he was summoned to join the Hungarian army by the Emperor Francis; later entered the Austrian army, taking part in the campaigns of 1814–15 against Napoleon and subsequently in Italy; and several years later was appointed colonel. He was in Italy in 1848, serving as a colonel in an Hussar regiment, when he was chosen by Count Batthyani who had formed a new Cabinet, for the portfolio of Minister of War. Acting in this capacity he was largely instrumental in bringing the Hungarian army to a high degree of efficiency. In September of that year, having gone to the scene of war in the south, he was defeated before the Rascian ramparts of Szent Tamas. When Austria purposed the subjugation of Hungary, Mészáros took command

the Hungarian forces in the north, but on 4 January his army was routed at Kaschu. In April 1849 after the declaration of independence he again took command of the Hungarian forces, but after the defeats at Szöreg and Temesvár in August he fled to Turkey. He subsequently lived in England, France, the island of Jersey, and in 1853 came to the United States.

META, mā'tä, a river of South America, which has its rise on the eastern slope of the Andes Mountains near Bogotá in Colombia. It is formed by the junction of two small mountain streams, which unite about 40 miles southeast of Bogotá; then flows east-northeast into the Orinoco; a course of about 650 miles.

METABETCHOUAN, mĕt"ą-bĕt-choo-ăn', Canada, a river of Quebec flowing into Lake Saint John from the south. It is a broad stream, 90 miles long, and navigable for a considerable distance. The celebrated Falls of Metabetchouan over 230 feet high are near its mouth.

METABOLISM (Greek *μεταβολή* a change), the whole series of physico-chemical processes connected with the manufacture of protoplasm and with nutrition and growth. Under the term is included all those changes by which various energy transformations are made possible in the human body. It has been divided into constructive metabolism (anabolism), and destructive metabolism (katabolism). The former comprises the processes by which the substances taken as food are converted into protoplasm, while katabolism is the means by which the protoplasm is broken down into simpler products, such as the excretory or waste matters. Metabolism thus comprises the elementary vital phenomena of plant and animal life. These are the occurrences associated with changes of substance, of form and of energy. All organisms undergo continual changes of their substance or protoplasm, etc., alterations of their form and transformations of the energy which they get from the environment. The human body is essentially an energy transformer. Thus as regards food, since all living matter is continually undergoing decomposition, it must take in substances that contain all the chemical elements of which it is constructed, but the food differs with every form of cell. Plants live chiefly on inorganic substances and animals on organic, that is, material already prepared; no animal being able to live on simple inorganic compounds. Among animals there is a remarkable adaptation to a single kind of food. For example the larva of the fur-moth lives exclusively upon the hairs of fur, which consist of pure keratin; this substance, which is closely allied to proteid, is therefore capable of furnishing all the elements necessary for the formation of the protoplasm of this caterpillar. Dogs when worked hard have been found to be able to live on pure proteid food. On the other hand, according to Verworn, it is impossible for an animal to live solely on carbohydrates or fats, or even on the two together, since there is no nitrogen in these substances.

Vital motion or metabolism is a complex sharply characterizing living organisms, and the taking in of food and the excretion of waste products give to the organism the material with which to regenerate itself and to grow. Metabolism is increased by heat, the consumption of oxygen being increased in cold-blooded animals, but warm-blooded animals undergo a decrease under heat. Thus man in winter has a much more active metabolism than in summer, since he consumes more food at low temperatures.

It is claimed by Verworn that every species of animal possesses a specific metabolism, and that under certain conditions products of metabolism may stimulate an animal to increased growth, while under other circumstances they may retard growth. Thus the usually deadly uric acid in moderate amounts exerts a favorable influence on the size of larvæ of sea-urchins. Illustrations are afforded by experiments in raising snails and water-fleas (*Daphnia*) in small volumes of water; besides the diminished volume, the water fouled by their excretions may not only dwarf but gradually kill them, or produce changes of form. Metabolism is more active in the young than in the adult. Between 9 and 14 a boy requires as much food as a full-grown man, and during the next five years more than a man. The same is not true of girls who increase the amount of metabolism up to the 11th year.

Consult Verworn, 'General Physiology' (New York 1899); Vernon, 'Variation in Animals and Plants' (New York 1903); Starling, 'Human Physiology' (Philadelphia 1915); Bayliss, 'Principles of General Physiology' (New York 1915).

METACENTRE, *in hydrostatics,* the point of intersection of a vertical line passing through the centre of gravity of a floating body as a ship *in equilibrio,* and a vertical line through the centre of gravity of the fluid displaced, if the body be turned through a small angle, so that the axis takes a position inclined to the vertical. If the metacentre is above the centre of gravity, the position of the body is stable; if below it, it is unstable. In shipbuilding a vessel must be so designed that its metacentre (its changing centre of buoyancy) is not likely to oscillate so as to permit capsizing.

METACHROSIS, the change of color brought about in the surface of certain animals, either voluntarily or involuntarily, to make them conform to their surroundings. It is exhibited in many of the lower animals as a protective device, especially in cuttlefishes, caterpillars, various amphibians, especially frogs and certain lizards, notably the chameleons. The dark pigment to which the brown or gray colors of metachroic caterpillars are due is deposited in the cells of the outer skin, while the green coloring matter is found in the underlying fat; and, as Carpenter says, experiments have shown that the presence or absence of both kinds of pigment is determined by the surrounding objects through the quality of the light reflected from them, the suppression of the superficial dark pigment allowing the deeper green to show through the skin, and thus give its hue to the caterpillar. It has been shown that the formation of the dark pigment is hindered by the action of certain yellow rays which are absorbed by dark objects, but reflected from green leaves and shoots. The process of change in squids, frogs, etc., through nervous and muscular control of pigment sacs, called chromatophores, is somewhat different, and is explained in the article CHAMELEON.

The power possessed by these animals of adapting their color to their surroundings must be of great value in ensuring preservation from enemies. Consult Beddard, 'Animal Coloration' (1892).

METACINNABARITE, a native sulphid of mercury, occurring amorphously, when it is black or dark gray, or in tetrahedral crystals. To its black color it owes its early popular name, Æthiops mineral. Metacinnabarite is found in California.

METAGENESIS, or **HETEROGONY,** a term proposed by Owen for a form of parthenogenesis. It is that form of alternation of generations (q.v.) of which one generation reproduces only asexually, by division or budding, the other exclusively by laying eggs. A good example is the mode of reproduction of hydromedusæ in which the hydra-like stage gives rise to medusæ, the latter laying eggs. Another case is that of the aphides, whose asexual individuals produce multitudes of young by budding, the next generation consisting of males and females, the latter laying fertilized eggs. An individual of the first generation is called the nurse; one of the second generation the sexual animal.

Another term for this phase of reproduction is heterogony (or heterogenesis), which Hertwig defines as "regressive alternation of generations." He mentions another form of heterogony where two generations with different forms and structure alternate. For example, a hermaphroditic thread-worm (*Ascans nigrovenosa*) lives in the lungs of frogs; it produces a form (*Rhabdonema nigrovenosum*) which lives in mud, and which lays eggs giving rise to the ascaris of the frog.

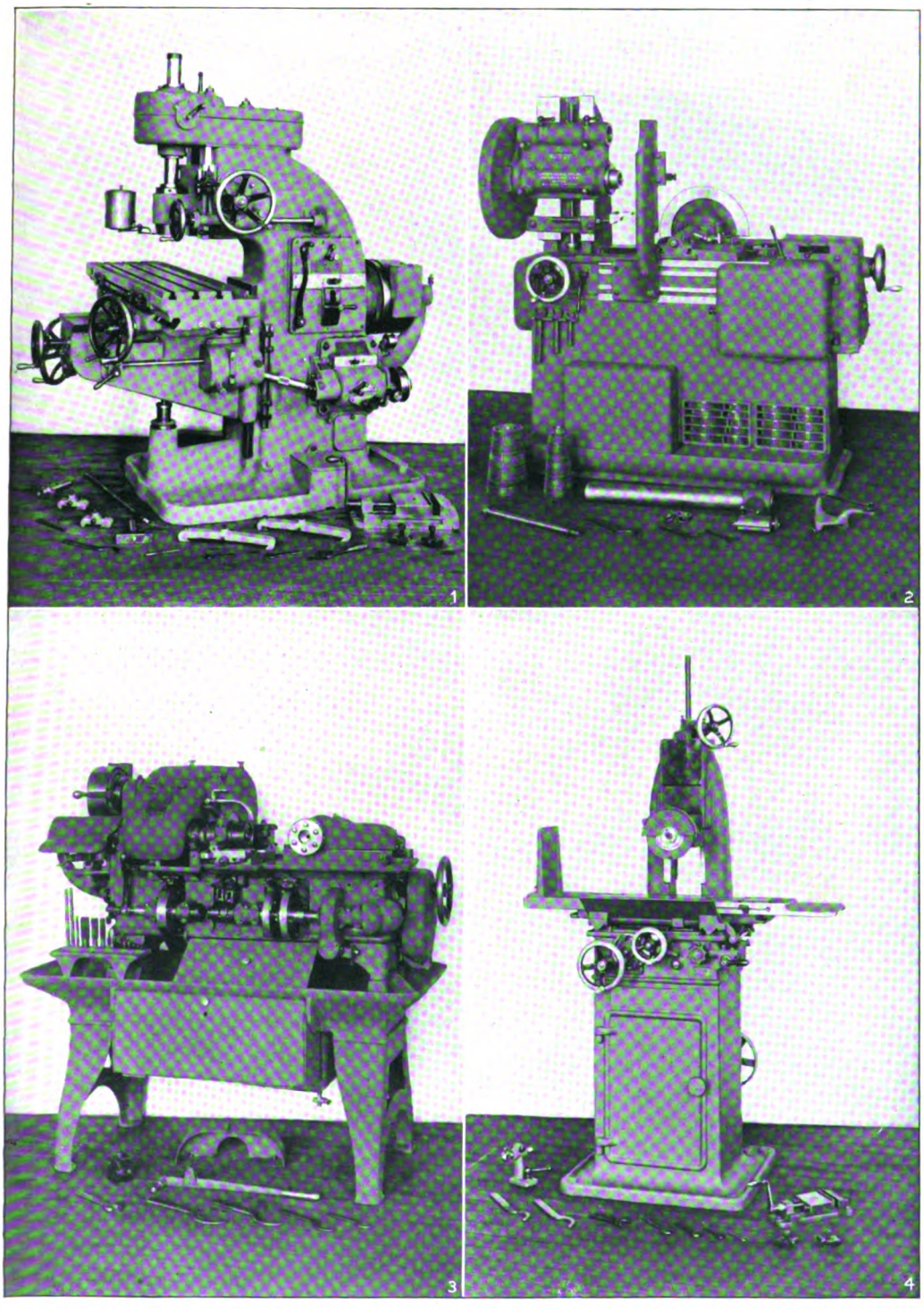
METAHEWETTITE, a dark red mineral consisting of hydrous calcium vanadinite occurring in microscopic crystals with uraninite and carnotite at several localities in Utah. Probable composition $CaO.3V_2O_5.9H_2O$; a source of vanadium.

METAL WORK, any work done in metals, but especially handwork practised as a decorative art, in which the materials are metal and the designs are executed in repoussé or relief. This may be accomplished either by carving or expert hammering as of thin sheet metal. The term includes jewelry (q.v.) and goldsmith's work; hence its materials are often the precious metals and its end personal adornment. But it is often applied to larger work and especially to metal decoration in architecture, apparently a later development in the arts than was the jeweler's trade, which flourished in classical antiquity, and everywhere seems to have quickly followed the most primary knowledge of metallurgy in industrial evolution. The Middle Ages were the great period of metal work, notably in connection with Gothic art. Even the more valuable metals were lavishly used in this epoch, as before in the Byzantine period, and since in the architecture of the Greek Church, above all in Russia. One of the foremost instances of Italian metal work is to be found in the altars of Saint James at Pistoria and of the baptistery of Saint John in Florence. Each of these was the work of a line of great artists, whose elaborate work upon them covered more than a century. Cellini (q.v.) was the greatest metal worker of the 16th century. Even more important than the work in silver and gold are the great bronze doors in the Florence baptistery, one by Ghiberti and another by Pisano, each the product of a score of years of labor, and both dating from the 15th century. Wrought iron work began to be used in the 12th century; between the 13th and the 18th centuries in the shape of gates, grilles and screens in ecclesiastical and in German locks and hinges of great beauty, it came to its most perfect form. The sepulchral brasses of German, French and English churches should also be mentioned. See BRASSES.

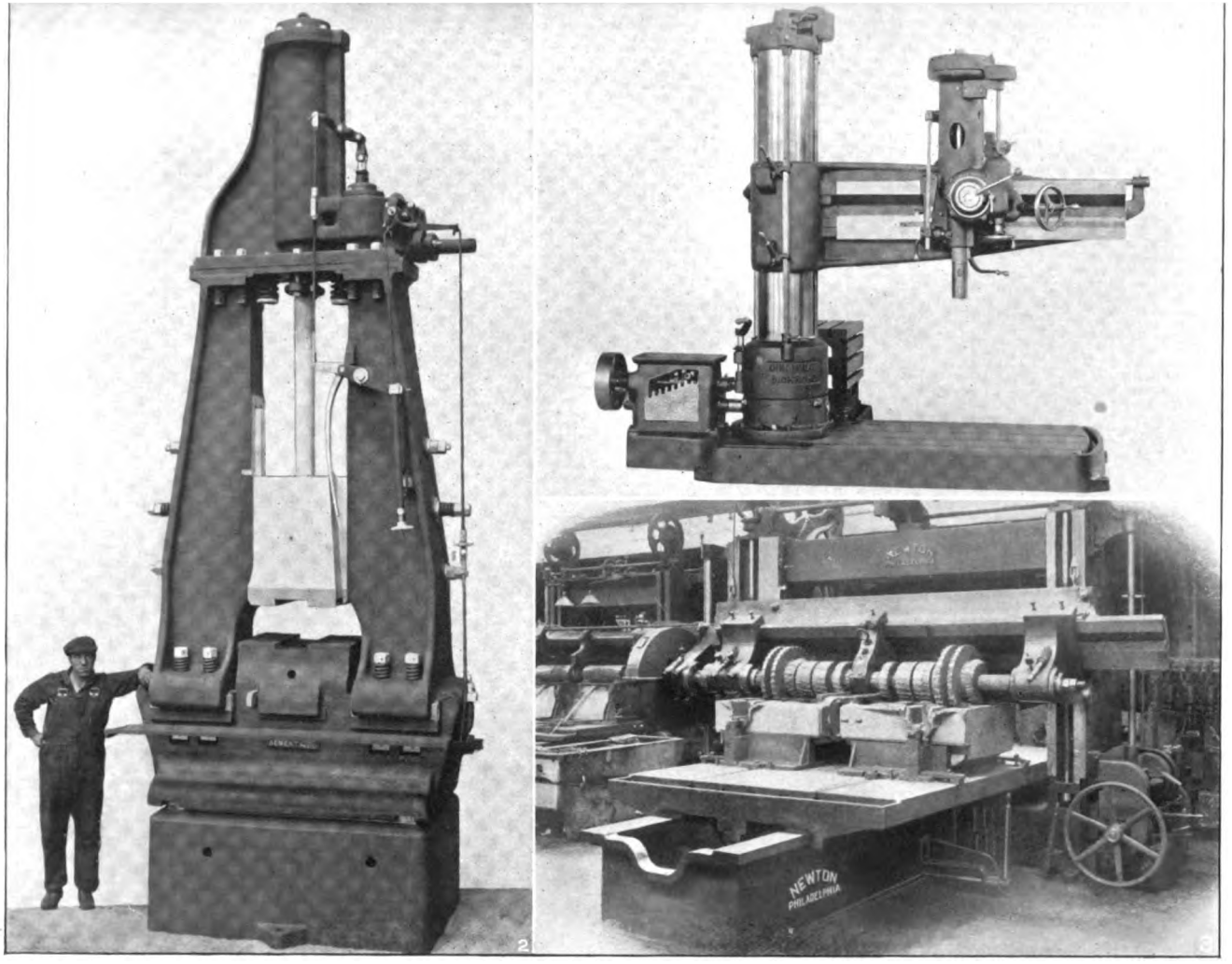
METAL WORKING MACHINERY, a term including practically all machines by which metals are converted into shapes required by modern structural work and the industrial trades. They may be conveniently arranged under the following named classes: Lathes; borers or drills; punches; shears; milling machines; grinders; riveters; drop hammers; bending rolls; rolling machines; presses; planers; saws and special machines.

Lathes are turning machines used to certain cylindrical surfaces by rotating a bar of metal against a fixed cutting tool. They are also used for spinning sheet metal into form. The principal parts are the head stock holding the driving cone and revolving spindle; the tail stock supporting the back centre, and capable of being clamped at any point on the centre line of the bed or frame, and the rest or carriage bearing the tool head. The bar of metal to be worked is fastened to the head and tail stock and rotated or turned by belts from shafting or by electric motors, while the rest carrying the cutting tool is moved parallel with the axis of the bar from the surface of which a spiral shaving is removed. By suitable attachments the lathe may be used for tooling flat surfaces, sawing or grooving and cutting gear wheels. These machines are made in a great number of sizes, of which the principal forms may be designated as follows: (1) The hand lathe, driven by hand power, usually by a drill-bow but sometimes by an assistant at the crank, is without self-acting feeding devices for regulating the cutting tool. (2) The foot lathe, small and light, worked by the operator's foot and adaptable to work as delicate as that of the watchmaker and jeweler. (3) The self-acting lathe; in which the cutting tool is borne in a carriage which is moved by mechanical means, causing it to traverse automatically the object being turned — these lathes are adapted for screw cutting and are often so designated. (4) The chucking or face lathe; for turning cylinders several feet in diameter and many feet in length, such as engine cylinders and the tubing and jackets of large ordnance. The turret lathe belongs to chucking class, but the face of the chuck is horizontal, the revolving spindle being vertical. (5) The boring lathe, used for working on internal cylindrical surfaces. A bench lathe is a small model of any of the several types so arranged that it may be bolted to a work bench. An automatic lathe is one of the larger types fitted with mechanism by which it stops itself when the work it is set to do has been completed. Any lathe may belong to the single geared or back gear

METAL WORKING MACHINERY



1 Verticle Spindle Milling Machine
2 Automatic Gear Cutting Machine
3 Automatic Screw Machine
4 Surface Grinding Machine

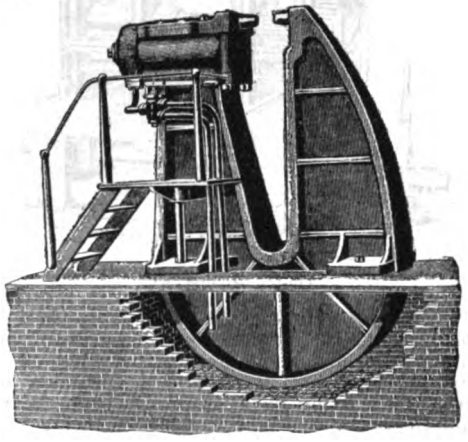


1 Plain Radial Drill

2 Steam Drop Hammer

3 Horizontal Milling Machine

type. In the latter a set of gear wheels operates a back shaft, by which the speed of the work may be greatly reduced. Overhead shafting on the lathe standards or on the ceiling provides means for giving a revolving motion to the tools at work, thus affording a combined motion of great variety and intricacy for involved work.



150-Ton Fixed Riveter.

Borers or Drills.— Boring machines, if operated by hand power, are called "hand-drills," otherwise, "power drills." They are of two types, the horizontal and the vertical. The cutting tool is formed upon an axially rotating spindle designed to bore or drill cylindrical holes. They vary greatly in size and pattern; in the number of spindles employed and the manner of their arrangement. Large holes, either horizontal, vertical or inclined, such as engine cylinders, tubing for ordnance and hollow shafting, are worked on a boring lathe, carrying usually two or more separate spindles clamped in a cylindrical tool head. Drills are especially useful as reamers to finish holes made by punches, and also to give exact cylindrical forms to the internal surfaces of hollow castings of any kind.

Punches.— Punching machines are of the single or multiple type, capable of punching one or several holes at a time. They are used for punching rivet holes in boiler and armor plates, plates for girders and other structural metal work. The perforation is accomplished by the thrust of a cylindrical punch under great pressure. Though usually made to punch round holes they are also worked with "drifters" which square up the round holes. The power employed is steam or hydraulic, generated by individual engines for large and belt-driven machinery for small work.

Shears.— Shearing machines and punches are similar in general construction and operation, excepting that in the former cutting edges which pass each other like the blades of a pair of scissors take the place of the punching tool. Their name and action sufficiently describe the purposes for which they are used.

Milling Machines.—Are of great importance in the manufacture of iron work of moderate dimensions such as parts of sewing machines, automobiles, rifles and pistols. In general construction a frame-work carries a spindle actuated by a pulley, and a table upon which chucks or holding devices are arranged. Gear-wheel attachments to the cone pulley provide for changes of speed or greater driving power at the cutters. The advantages gained by their use are as follows: The rotary cutters insure a continuous cutting operation, with a constantly changing cutting edge; the outlines of the work and the form of the cutting edges are exactly similar; once adjusted, all work is turned out uniform in size and shape, and any unlimited variety of shapes may be obtained by simply varying the form of the cutters, while the only special operating skill required is to maintain the form of the cutters and set the work.

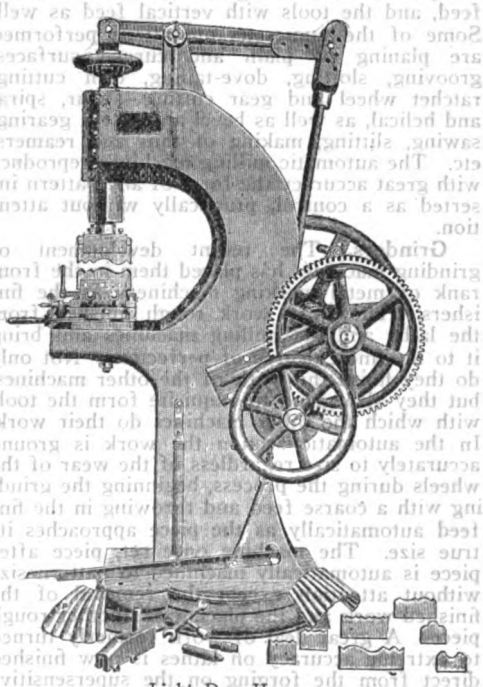
The modern milling machines have been brought to a high degree of perfection and produce work in a truly wonderful variety. The milling cutters are worked singly or in "gangs" of many forms on the same shaft. The tables are provided with longitudinal feed and cross feed, and the tools with vertical feed as well. Some of the numerous operations performed are planing of plain and curved surfaces, grooving, slotting, dove-tailing, cam cutting, ratchet wheel and gear cutting — spur, spiral and helical, as well as bevel and worm gearing, sawing, slitting, making of taps and reamers, etc. The automatic milling machines reproduce with great accuracy the form of any pattern inserted as a control, practically without attention.

Grinders.— The recent development of grinding machines has placed them in the front rank of metal working machinery as the finishers. They take work rough finished from the lathe and the milling machines and bring it to the finest degree of perfection. Not only do they finish the work of the other machines, but they also grind to exquisite form the tools with which the other machines do their work. In the automatic section the work is ground accurately to size regardless of the wear of the wheels during the process, beginning the grinding with a coarse feed and throwing in the fine feed automatically as the piece approaches its true size. The machine once set, piece after piece is automatically machined to pattern size without attention except the removal of the finished work and the placing of another rough piece. A great deal of work formerly turned to extreme accuracy on lathes is now finished direct from the forging on the supersensitive automatic grinder and with a very considerable saving of time. See GRINDING.

Riveters.— Riveting machines are made in two forms, stationary and portable; the former used in heavy work are operated by pressure generated by steam or hydraulic power, while in the portable form the moving die is actuated by steam or compressed air, with hammer-like blows. They are employed to drive and head hot rivets in boiler work, bridge building and other structural work with results far superior to hand work in rapidity and efficiency. The usual form of the stationary type is a U-shaped frame or yoke. The ends of the arms are provided with dies projecting inwardly, one being fixed while the other has a reciprocating motion. The rivet being placed in the hole is compressed endwise between the dies; the pressure forces the metal of the rivet into the ir-

regular edge of the hole, clamps the plates together and forms the rivet head.

Drop Hammers.— Heavy drop hammers are used for forging and also for welding, and are operated by hydraulic or steam power. They consist of an anvil upon a solid base of steel blocks laid over oak timbers to give elasticity to the machine. Above the anvil vertical housings capped by steel arches support the hammering ram and the platforms upon which the piston cylinder and other actuating machinery is placed. By the use of swages, fullers and flatters, hot metal is hammered into forms, often by the use of a progressive series of dies. The largest hammer of this kind was erected in 1891 at Bethlehem (Pa.) Steel Works. Its general dimensions and weight are as follows: Height, 90 feet; width, 42 feet; weight of anvil and foundation, 1,800 tons; weight of housings, steam chests, pressure cylinders and piston, about 1,000 tons. Ram 19 feet long, 10 feet wide and 4 feet thick,

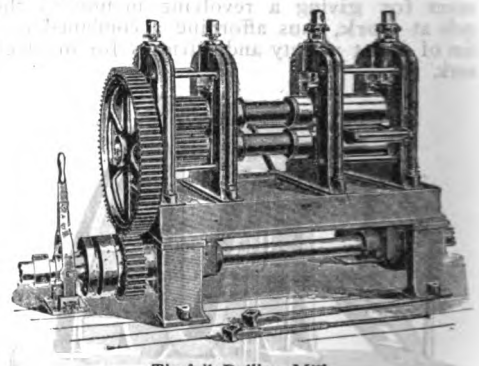


Light Drop-Hammer.

weighing 100 tons. Lighter forms of drop hammers are actuated by compressed air and are called pneumatic hammers. They are used principally as cornice bending machines.

Bending Rolls and Benders are used generally in boiler and tank work; the metal plates being drawn by rotation between three rolls so arranged that their axes form the edges of a triangular prism, their relative adjustment determining the curve to which the plate is bent.

Rolling Machines are used to flatten out metal bars into plates and commercial shapes, such as I-beams, railroad rails, etc. As designed at present they accomplish in a short space of time a great variety of work which in times past was turned out by the more laborious and expensive processes of lathe turning and forging. One class is used to manufacture boiler and armor plate and the general run of heavy sheet metal; while another class produces the thin sheet metal down to the finest grades such as tinfoil.

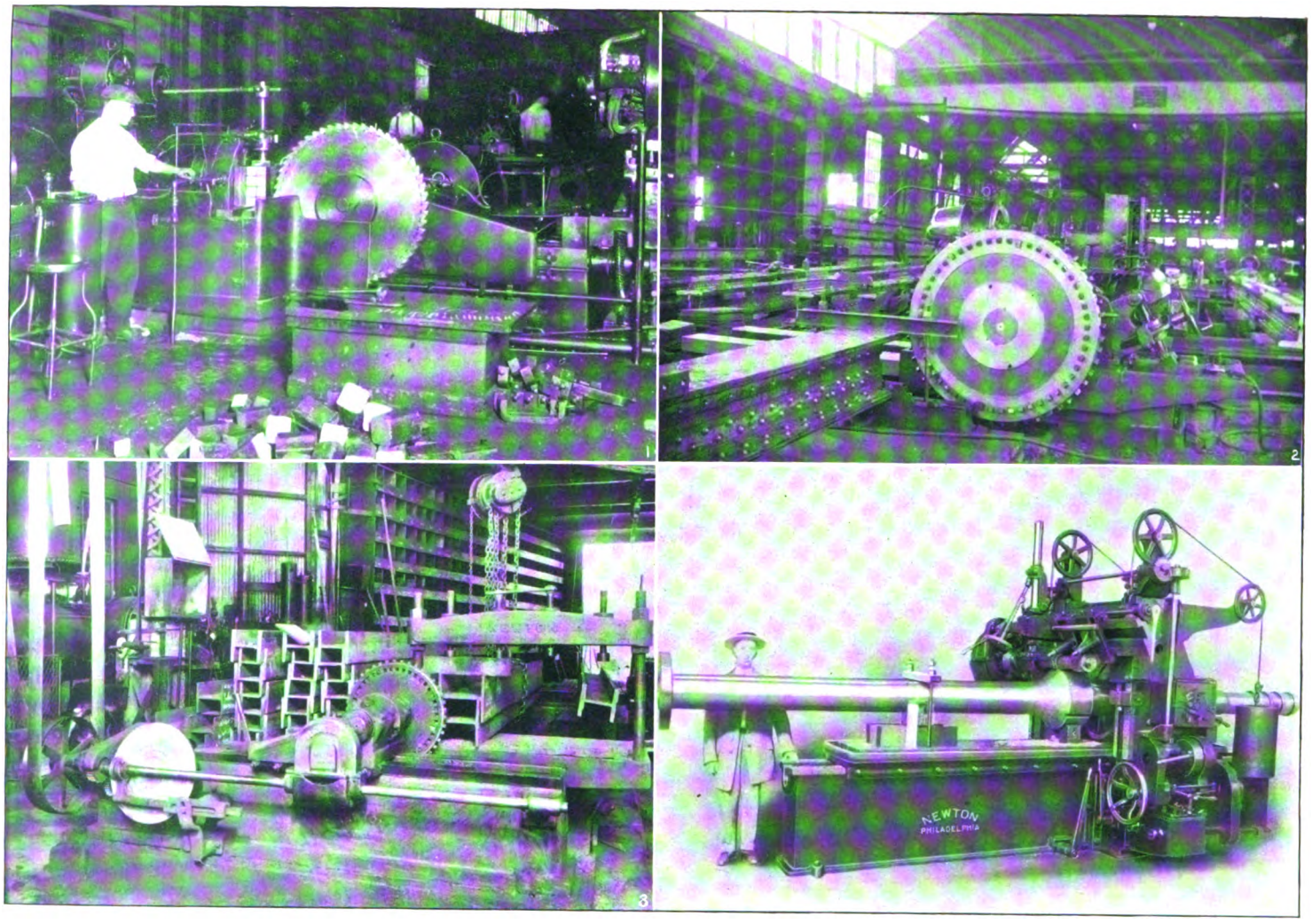


Tin-foil Rolling Mill.

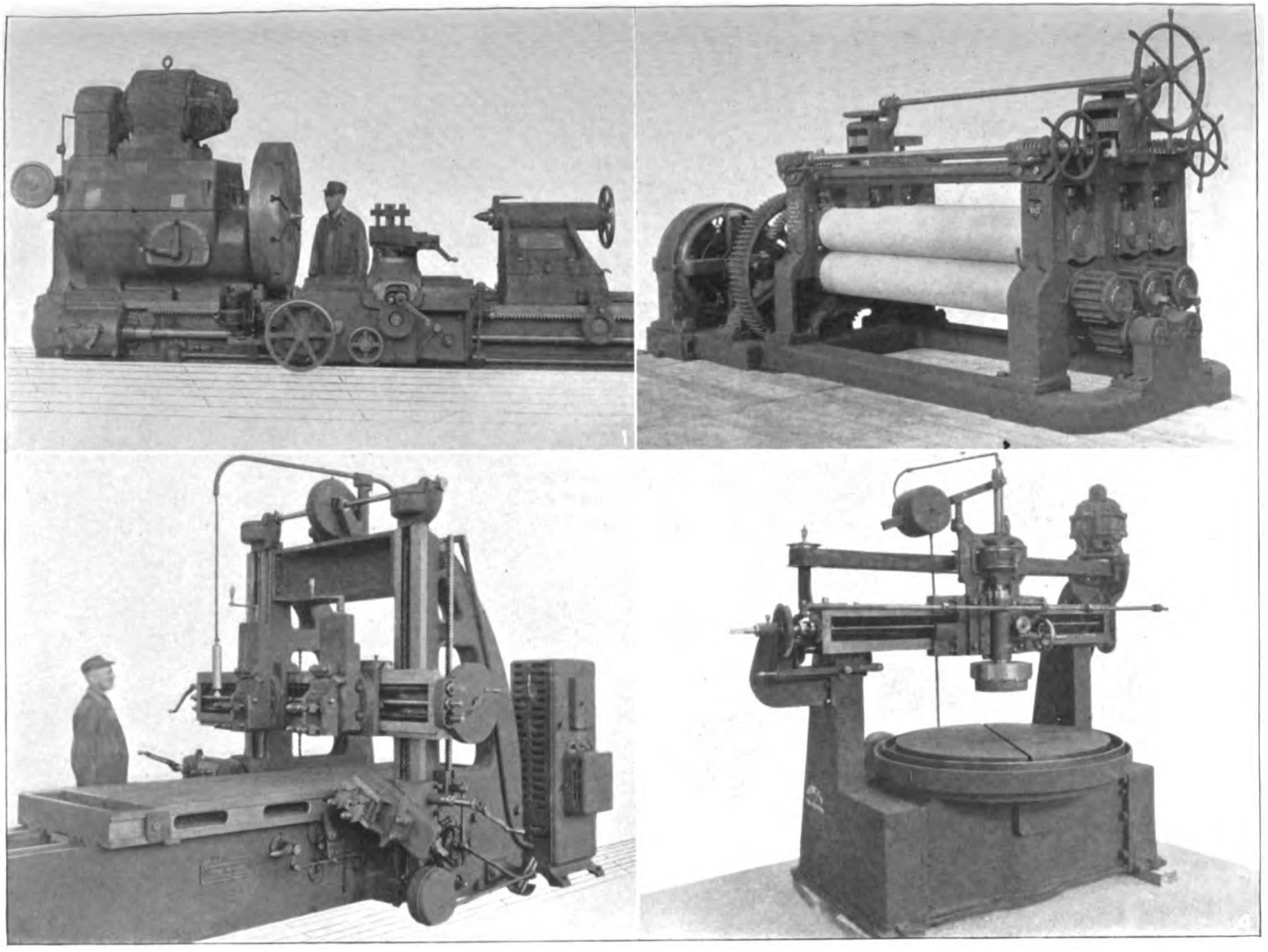
Presses.— By the use of **presses** sheet or plate metal is converted into utensils of any desired form. They are usually operated by hydraulic power; are provided with dies between which the metal is pressed into the required form, and are capable of being constructed to exert an unlimited amount of pressure. Forging presses are made in all sizes adapted for uses ranging from the pressing of watch-cases to the forging of steamship shafts and of armor plates weighing up to 14,000 pounds. Forgings thus made are superior to hammered forgings. They are designed for working metals either hot or cold.

Planers.— Planing machines are used to obtain flat surfaces on metal. There are two types; those in which the motion of the table relative to the cutting tool is rectilinear and those in which that motion is rotary. In general construction a planer consists of a traversing table on which the work is fastened; a bed to receive the table and guide it in a right line; a cross slide to support the slide rest carrying the tool; standards bolted to the bed and supporting the cross slide, and the mechanical devices for feeding and regulating purposes. The power supplied from shafting by belts is transformed by gear-wheel attachments into the reciprocating motion of the table, causing it to slide, back and forth between the vertical guides, thus bringing the work against the cutting tool which shaves off successively, side by side, narrow thin strips of metal until a perfectly flat surface is produced. Planers are built in various sizes, the larger machines being equipped with tables 7 to 8 feet in width and 20 feet long.

Saws.— In metal working, saws belong to the class commonly termed finishing machines. For cutting plates and bars into shorter lengths they are in extensive use, affording a great economy of time. They are built in a great many sizes and forms, both stationary and portable, equipped with single cutters or cutters arranged in gangs. For cutting off large bars such as steel beams, rails and similar shapes, saws with single cutters are generally used, the object being fastened to a carriage and moved into contact with the edge of the circular cutter. Some machines used for lighter work are so arranged that the circular saws are moved



1 Cold Saw Cutting-off Machine
2 Rotary Planing Machine
3 Combination Cold Saw Cutting-off Machine
4 Horizontal Milling Machine



1 48-inch Engine Lathe
3 Reversing Motor Planer

2 Straightening Rolls
4 Die Grinding Machine

into contact with the bars. The cutters are of two kinds. The friction discs made of soft mild steel, without teeth, measuring about 44 inches in diameter and three-sixteenths of an inch in thickness, are used for cutting off either hot or cold metal. They are run at a high rate of speed, about 15,000 feet per minute, rim velocity. The toothed cutters vary greatly in diameter and thickness; are made of highly-tempered steel, and are used for clean cutting in cold metal. They are usually run at a low rate of speed, the rim velocity varying from 130 to 150 feet per minute. Friction discs run at rim velocities between 20,000 and 25,000 feet per minute are called fusion discs, from the fact that the intense heat generated by the friction actually melts the metallic dust ground off by the cutter.

Special Machines.— This term includes an almost endless variety of metal-working machinery, capable of enumeration only in a very general way. They are used for special purposes such as making pins, nails, rivets and pens; the tapping of nuts and the threading of bolts. Although often of very complex construction they turn out work with great rapidity and precision. In its special field metal-working machinery has not only displaced hand labor in all countries, and especially in the United States, but by its use structural work such as the building of magnificent buildings and bridges, powerful engines and mammoth ships have been produced far beyond the capabilities of that which is known industrially as hand labor. Consult Adam, H. M., and Evans, J. H., 'Metal Work' (London 1914); Colvin, F. H., and Stanley, F. A., 'American Machinist Grinding Book' (New York 1912); De Vries, D., 'Milling Machines and Milling Practice' (London 1916); Hasluck, P. N., 'Metal Working' (London 1904); Horner, J. G., 'Modern Milling Machines' (London 1906); Pull, E., 'Modern Milling' (New York 1917).

METALLIC CURRENCY. See CURRENCY.

METALLOGRAPHY. See IRON AND STEEL, METALLOGRAPHY OF.

METALLOID (Gr. "metal-like"), *in chemistry*, any non-metallic element. These are 13, namely, sulphur, phosphorous, fluorin, chlorin, iodine, bromine, silicon, boron, carbon, nitrogen, hydrogen, oxygen and selenium. The distinction between the metalloids and the metals is slight. The former, excepting selenium and phosphorus, do not have a "metallic" lustre; they are poor conductors of heat and electricity, are generally not reflectors of light and not electropositive; that is, no metalloid fails of all these tests. The term seems to have been introduced into modern usage instead of non-metals for the very reason that there is no hard and fast line between metals and non-metals, so that "metal-like" or "resembling metals" is a better description of the class than the purely negative "non-metals." Originally it was applied to the non-metals which are solid at ordinary temperatures.

METALLURGY, the extraction of metals from their ores and so refining and fashioning them as to fit them for use in the metal industries, is the most ancient of arts. The annals of history show that the degree of civilization attained by a race was directly proportional to the extent to which they made use of metallurgical processes. In fact, a prominent metallurgist of the 19th century when delivering an introductory address to students of metallurgy was accustomed to charge them that "in proportion to the success with which the metallurgic art is practised in this country, will the interests of the whole population directly or indirectly in no inconsiderable degree be promoted."

As an industry, it requires a wide knowledge of the sciences, embracing chemistry, physics and mineralogy, as well as the professions of mechanical and electrical engineering. As some of the oldest historical works make reference to metallurgical processes, the actual practice of the art must go much farther back into prehistoric ages. It had its inception at the time when men, ever advancing, replaced their stone implements by others of greater usefulness made from metals. Their methods of extracting and refining were in many respects comparable with those used to-day except in the introduction of mechanical improvements. The early development of chemistry was very closely allied with metallurgy. Many of the older treatises on theories of chemistry are attempts to explain metallurgical reactions. Prominent among these was the separation of lead from the precious metals, gold and silver, by its combination with oxygen, a process practised and much speculated upon by the ancients. Gold was probably the first metal known as it occurs naturally in the metallic state, is bright, heavy and easily worked. Iron, copper, silver, tin and lead were other metals known to prehistoric men. Quicksilver is mentioned in the times of the Greeks and Romans. In the 15th and 16th centuries we hear of antimony, bismuth and zinc, with arsenic added at the close of the 17th century. Nickel, cobalt, manganese and platinum came in the 18th century, the remainder belonging to the 19th and 20th.

There are four great periods in the annals of metallurgy. The first extended from prehistoric times to the 1st century A.D., when Pliny, the Elder, in his work, 'Naturalis Historia,' collected all existing knowledge concerning metals to his day. The second period ending with the 15th century had as its chronicler Agricola, in 'De Re Metallica.' Next came a period of comparative stagnation with relatively few important advances until the 19th century ushered in the fourth, our present period, one filled with development.

Properties of Metals.—All metals are distinguished by numerous characteristic properties which fit them for their various industrial applications. A brief outline of these follows: *Density.*—All common metals except aluminum are relatively heavy, specific gravities ranging from 6 to 22½. The density of metals varies, within moderate limits, due to methods of casting, rates of cooling and subsequent mechanical treatments. All metals except bismuth are lighter when liquid than when solid; i.e., they contract on solidification. *Color and Lustre.*— The metals vary considerably in color and lustre and many industrial uses depend upon these differences, particularly in reference to the use of metals for ornamentation. *Opacity.* —This is a property of all metals under normal conditions. *Crystallization.*—All metals crystallize in definite geometrical forms on free

solidification. *Structure.*— This is revealed in fractures examined by the eye and in polished and etched sections examined under the all-powerful eye of the microscope. Unmistakable evidence of the thermal and mechanical treatment which the metal has undergone is furnished the expert by such examination. Such a study often serves to distinguish one metal from another, making unnecessary the resort to chemical analysis. *Hardness.*— There are several methods of determining this property: scratch hardness, or resistance to abrasion; indentation hardness, or the resistance offered to penetration by a body of greater hardness, as in the familiar Brinell method where a hardened steel ball is used for this purpose; rebound hardness, measured by the height to which a hard body will rebound when allowed to fall upon the metal being tested as typified by the Shore sclerescope method; cutting hardness, or the resistance offered to cutting by a hard tool. This is usually measured by determining the number of revolutions of a standard drill to produce a given penetration. *Strength.* — This property is measured by resistance to rupture; by slow direct pull, bend, compression or twist; by sudden blow; by repeated bending or blows or a combination of both. *Brittleness* and *Toughness.*— These two, opposing properties, are indicated by the way in which the metal behaves when subjected to strength tests. The same metal may appear as brittle or tough, depending on the conditions of test. *Plasticity.* — This property accounting for malleability and ductility, is the ability of the metal to flow under pressure in the hot and in the cold state. It is all important in the working of metals in the industries. If metals did not possess this property, the operations of hammering, rolling, drawing, spinning, etc., through which all metal articles must pass, during fabrication, would be impossible. *Weldability.*— This is the capacity of pieces of metal to unite into one continuous metal when heated and brought into intimate contact. *Fusibility.*—All metals except mercury are solid at ordinary temperatures, yet they can be melted — brought into a state of fusion — by application of sufficient heat. *Volatility.*—All metals may be vaporized at high temperatures. *Diffusion.*— This is the property of molecules of one metal to migrate into another when brought into intimate contact, either in the liquid or solid states. *Occlusion.*— The rapidity and ease with which metals dissolve gases is augmented by high temperatures. Expansion and contraction with changes in temperature; thermal and electrical conductivity; magnetic permeability, or ability to conduct lines of magnetic force, are all properties which find great application in the industrial use of metals.

Although metallurgy is concerned with the extraction and purification of metals, few of them are used in the pure state. Practically all of the metal produced finds its way into alloys before it comes to the consumer's hands. Alloys, from the Latin, *alligo*, "to bind to," were defined by Birminguccio as "amicable associations of metals with each other." Alloys may be formed by fusion, compression or electro-deposition. By far the most of them are formed by fusion. By the alloying of metals new properties result which increase their suitability for commercial uses; for instance, an alloy is produced with a coefficient of expansion of zero to make possible the manufacture of clocks which will be accurate at all temperatures. Wire is produced with the same coefficient of expansion as glass for use in electric light bulbs. Before the metallurgist gave us this alloy we used the rare metal platinum for this purpose. Alloy steels of unheard-of strength and anti-fatigue properties are produced for use in automobiles and aeroplanes. Innumerable articles of common and special use show that most metallic objects are alloys possessing special properties to meet special needs. Frequently the change of a few tenths of a per cent of the amount of a constituent present in an alloy will cause the most startling changes in the properties of the resultant metal. Of all the innumerable operations of metallurgy there is hardly one which does not require the application of heat for its successful promotion. Heat is usually supplied by the combustion of a fuel and must be applied in many different ways and under various conditions to suit the metallurgical process to be carried out. Therefore, knowing the metallurgical requirements we must know the characteristics of the available fuels in order to determine which are to be used and the methods of using them to produce desired results.

Fuels.—Although fuels are complex chemical combinations, the main heat-producing elements of all are carbon and hydrogen. When a fuel is once kindled the combustion will continue as long as the heat evolved is sufficient to keep the temperature above the ignition point. Essential conditions for perfect combustion are: first, sufficient air brought into intimate contact with the fuel; second, sufficient time in which it may act; third, temperature suitable for combustion must be maintained throughout. From these considerations it is evident that less excess air need be used with gaseous than solid fuels to get an intimate mixture. Mechanical methods of producing mixtures are frequently employed. The form of solid fuel affects combustion, porous fuels taking more air, caking fuels causing imperfect combustion, etc. With perfect combustion, the products are carbon dioxide and water. The atmosphere in the furnace resulting from the products of combustion may be either neutral, oxidizing or reducing. A neutral atmosphere which results from perfect combustion is very difficult to maintain. Under ordinary conditions we either supply an excess of air which results in an oxidizing atmosphere, or we do not furnish enough air for perfect combustion and this results in a reducing atmosphere. There are long and short flame fuels depending upon the amount of combustible gases evolved and the facilities existing for mixing air and gas. All these are important considerations in the use of fuel and design of combustion chambers. Fuels are rated by their calorific values. There are three classes: solid, liquid and gaseous. The solid are classified as natural (wood, peat, lignite, coal) and prepared (charcoal, coke, begasse, etc.). The liquid fuels are natural, as petroleum; and artificial, as distilled oils, tars, etc. The gaseous fuels may be divided as natural gas, or artificial (manufactured gas, oil, water, coal, blast furnace, producer gas, etc., etc.). Each of these different classes of fuels presents its own problem in

combustion and its characteristics must be known and considered in designing the furnace in which it burns. A furnace which burns coke well, will not burn tar at all. In blast-furnace work the compressive strength of the fuel must be considered as that determines the weight of charge it can support.

Apparatus.— Having determined the conditions and methods by which the heat is to be generated and applied to the metallurgical process, we must consider the requirements of a containing vessel which will stand the oftentimes intense heats employed, have a certain amount of strength and at the same time exert beneficial, not harmful, chemical effects on the charge. The materials to which we turn to play this part in our sequence of processes are known as refractories. An ideal refractory not only should be a poor heat and electrical conductor, but must also resist the action of the high temperature causing it to melt away, resist the effects of sudden temperature changes, have mechanical strength and resist chemical changes. As no single material having all these qualities exists, metallurgical furnaces must be constructed in parts, i.e., a refractory inner lining, an intermediate insulating section and an outer wall for strength and protection. The principal constituents of refractory materials are aluminum silicates or clays, silica, alumina, lime, magnesium, chromite. These materials, though relatively infusible in themselves at the temperatures of metallurgical processes, must in order to be in shape to be used as furnace walls, be mixed with other ingredients which increase their mechanical strength at the expense of refractoriness. The common forms in which refractories are used, are as follows: Fireclay, composed of hydro-silicate of alumina combined with fragments of other materials. It is plastic when wet, becomes brick-like when burned at red heat. It is used as clay for binder and in making firebricks. Silica, mostly used as silica bricks, is made from quartzite, sandstone, ganister, etc., all consisting principally of silicon dioxide. Bauxite clay, principally an oxide of alumina is combined with a little silica and made into bricks. Lime pure is not much used as a refractory. Limestone mixed with fireclay is used in lining the test of a cupelling furnace. Calcined magnesite, containing a high per cent of magnesium oxide, is used either in the granular or brick form. Dolomite, a magnesium calcium carbonate, is not much used in brick form but is usually, after calcining and crushing to small size, mixed with dehydrated tar and rammed in to make a furnace bottom. Chromite, a compound principally of the oxides of chromium and iron, is used in the brick form and as a cement. Carbon bricks also find a use where a reducing atmosphere is required.

Refractories are classed chemically, as acid, basic or neutral; and by this arrangement, silica is the principal acid refractory. Bauxite, lime magnesite and dolomite are basic, while fireclay and chromite are neutral. Acid and basic materials in contact with each other readily slag and melt away. They cannot be used in contact with each other but may be used in the same furnace with a separating layer of neutral material.

Furnaces.— Metallurgical furnaces are divided into two broad classes: first, those in which the heat comes directly from the combustion of fuel; second, those in which electrical energy supplies the heat. Under class one fall the hearth furnaces, as the smith's forge; and the shaft furnace, as the blast furnace and the cupola. In these the fuel and charge to be heated are in direct contact. Then there are the reverbatory furnaces for roasting and smelting, where combustion takes place in a separate chamber and the charge is heated by the flame, also the closed vessel type of furnace, as crucible, retort, muffle, etc., where the charge is inside sealed off from the source of heat which plays on the outside. Under this class also, come those furnaces which are merely containers, using no outside fuel, the heat coming from the charge itself, as the roasting kiln, bessemer convertor, etc. The electrical furnaces are classed as: direct resistance, the charge itself being a part of the electrical circuit or resistor; indirect resistance where the charge is surrounded by an electrically heated resistor; direct arc furnaces, the charge forming one or both poles of an arc; indirect arc, the charge being in a space heated by an arc; arc resistance, where the charge is one pole of an arc and also a part of the electrical circuit.

Ores.— The metals occur in nature either as pure native metal or in combination with other materials in an ore. Ore is defined as a metal bearing substance from which a metal, alloy or metallic compound can be extracted at a profit. It usually consists of one or more economic minerals and a waste product or gangue. Ores are named according to their leading useful metal and are classified by the gangue as siliceous, calcareous, ferrugeneous; or broadly speaking, as acid and basic fluxing ores. Another classification refers to treatment, as smelting or milling ores. The metals occur in nature as native metals, gold, silver, copper, mercury; as oxides, iron, tin; as sulphides, and under this class come selenides, tellurides, arsenides, antimonides; as halides, silver, mercury; salts of acids, carbonates. silicates, etc. The largest number of commonly worked ores are in the oxide and sulphide classes.

Methods of Treatment.— It is here, by the treatment of the ores that we can divide metallurgical methods into two broad classes: wet metallurgy and dry metallurgy. The wet method of treating an ore involves a leeching by a chemical solvent, followed by a means of separation of the required metal from solution. The dry method involves smelting and subsequent purifying methods by means of high temperatures. Considering dry metallurgy, the ore as it is dug out of the ground is seldom in a condition fit for smelting. Some ores may only require to be crushed to a uniform size, as the oxide ore of iron, haemitite; others must be heated to drive off moisture and volatile matter, called calcining; others must be roasted; still others are weathered. Calcination, or the driving off of volatile matter, at a low temperature is usually carried out in heaps, stalls or kilns. Calcining in heaps consists of building up a pile of alternate layers of wood or coal and ore to the height of five or six feet, then igniting at the bottom and letting it burn itself out. This process is usually carried on in yards where protection from the winds

which will cause uneven burning, is afforded. The stall is the first improvement on the heap and consists of a four-walled enclosure, three permanent and the fourth built in after charging with fuel and ore. After the material is ignited the heat set free is sufficient to keep the process going. The process must be continuous and the losses of heat be kept at a minimum. This process is suitable only in ores which are rich in sulphur. A very large number of ores require a roasting preliminary to smelting. Roasting consists of heating the ore in contact with oxygen, chlorine, carbon, water vapor or sulphur, to a temperature below fusion or at most to incipient fusion with the purpose of driving off a volatile component. Roasts may be oxidizing, reducing, chloridizing or sulphating, according to the ore and the product desired. The most common form of roast is the oxidizing roast of sulphide ores to eliminate the sulphur and if carried to completion leaves a metallic oxide of the metal for smelting. This is called dead or sweet roasting and requires prolonged heating and much stirring. Otherwise, the sulphite is converted partially into oxide and partially into sulphates with some remaining sulphide. The chloridizing roast is used as a preliminary to a wet metallurgical process whereby a chloride is produced which is amenable to solvents. Roasting may be carried out in heaps, stalls, shaft furnaces or reverbatory furnaces.

The smelting for which the calcination, roasting, crushing, etc., are preliminary preparations processes, consists in separating the metal and gangue by their difference in specific gravities after fusion. A necessary adjunct of the smelting operation is a flux which renders the naturally infusible gangue readily fusible by the formation of a slag with it which is easily separated from the heavy metal. The fluxes are earthy materials and may be acid or basic, depending on the character of the ore used. Acid gangue in the ore requires basic flux and vice versa. Lime, a basic flux, is usually used in the carbonate form or limestone. Fluorspar, calcium fluoride, is used only in small amounts to increase the fluidity of the slag. Barytes, strongly basic, also reacts as a desulphurizing agent. Silicious or acid fluxes are sand, quartz, etc. Smelting is usually either oxidizing or reducing. The reducing smelting in treating oxide ores has for a reducing agent carbon monoxide formed from coke which is a part of the furnace charge. Oxidizing smelting is practised mainly with the purpose of refining a crude metal as many metallic impurities can be removed in this way. Other metallurgical processes are liquation, where advantage is taken of the difference of melting points of easily fusible compounds from infusible ones, when the combination is heated to the lower melting point the more easily fusible runs out leaving the highly infusible gangue; distillation and sublimation, where the metal is driven off as a vapor, then condensed as a liquid or solid; scorification, or the roasting of an alloy with the object of removing the more oxidizable metal as a slag. This process is used practically only for separation of silver and lead. Other processes are cupellation, similar to scorification where the oxidizing is carried out on a hearth or cupel which is of a material to absorb the fused oxide.

Wet metallurgy in general involves the separation of a metal in the form of a soluble salt from the insoluble gangue by means of a solvent followed by the recovery of the dissolved substance, by evaporation or precipitation. Amalgamation is a process in which the ore, usually gold or silver, is treated with mercury which dissolves the metal, and on subsequent heating the mercury distilled off, leaving the metal. The ores need to be in a finely divided state and in such form as to be readily amenable to solvents which frequently means preliminary treatment, as roasting, weathering, etc. The solvents in common use are water, aqueous solutions of gases; acids; bases, salt solutions. These solvents are used diluted and are warmed. Ores for leeching are classed as sands and slimes, the sands being coarse enough to permit the leeching by percolation. The slimes are so fine as to prohibit this method and require an agitation of slime with solvent. This gives a colloidal solution which must be coagulated, then separated by filtration or decantation. The solution is then concentrated by evaporation and the salt crystallized out. In dealing with precipitates they are usually dried in muffle, or reverbatory furnaces. The modern and most efficient method of treating slimes is by the flotation process of separation. The slime or pulp is fed into the bottom of a tank and agitated with oil and compressed air. Under this treatment the metal particles float on the surface while the gangue particles sink.

Metals produced by the above methods are rather impure. For final refinement of a metal and its production in the purest possible form electrolysis is resorted to. Reduced to its simplest form electrolysis consists of a solution of a salt of the metal to be purified in which two electrodes are dipped, one being of the impure metal and the other of the pure. When the electric current is passed through this bath the electrode of impure metal is dissolved away and chemically pure metal is deposited on the other electrode. After the metal is produced by some of the above processes it is usually made into some alloy by fusion with other metals and elements, then cast from the molten state into the finished shape or into ingots which must be forged by hammering, rolling, pressing, etc., into the desired form. These hot working operations are frequently followed by cold rolling as strips, sheets, spinning or pressing for shapes, cold drawing for wire. All these operations require careful and frequent heating and cooling. The metal must be annealed to remove strains and make it soft. In the case of steel produced by alloying carbon and iron it may be used for tools which require hardening and tempering by heating to a definite temperature, quenching in water or oil, then reheating to some lower temperature.

All of these processes fall under the metallurgist's care as surely as the original extraction and refining. See ALUMINUM; COPPER; COPPER, DISCOVERY AND DEVELOPMENT; COPPER AND BRASS INDUSTRY; ELECTROCHEMICAL INDUSTRIES; IRON AND STEEL INDUSTRY and articles on the other metals.

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ed., Philadelphia 1910); Sexton, A. H., 'Elementary Textbook of Metallurgy'.

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METALS. The elements which compose all natural objects are divided by chemists into two classes, metals and non-metals. Formerly the classification was based on physical properties, and the metals were then defined as those elements which were opaque, had a metallic lustre and were good conductors of heat and electricity; now the division is made on chemical properties, upon the foundational principle that the hydroxides of metals are bases, while the hydroxides of non-metals are acids. However, no sharp line can be drawn between the metals and non-metals, since a few of the elements will classify as either. Some metals have a high specific gravity, but lithium, sodium, potassium, etc., float on water, and in general the metals of highest specific gravity are least active chemically. Of the 83 recognized elements, 64 are regarded as metals.

The following classification of the elements usually placed in the group metals is that arising from the application of the periodic law (q.v.).

Class I. Two sub-classes: (1) Lithium, sodium, potassium, rubidium and caesium; (2) copper, silver and gold.

Class II. Two sub-classes: (1) Calcium, strontium, barium and radium; (2) glucinum (or beryllium), magnesium, zinc, cadmium and mercury.

Class III. Three sub-classes: (1) Aluminum, gallium, indium and thallium; (2) cerium, lanthanum, neodymium, praseodymium, samarium, europium and gadolinium; (3) terbium, dysprosium, holmium, yttrium, erbium, thulium, ytterbium, scandium, lutecium and celtium.

Class IV. Two sub-classes: (1) Titanium, zirconium and thorium; (2) germanium, tin and lead.

Class V. Two sub-classes: (1) Vanadium, niobium (or columbium) and tantalum; (2) arsenic, antimony and bismuth.

Class VI. Chromium, molybdenum, tungsten and uranium.

Class VII. Manganese.

Class VIII. Three sub-classes: (1) Iron, nickel and cobalt; (2) rhodium, ruthenium and palladium; (3) osmium, iridium and platinum.

A mass of any metal is considered to be composed of atoms arranged in molecules, and any change in the arrangement of the molecule means a change in physical characteristics. Thus crystalline structure may be obliterated by rolling or hammering a metal and by the same means the specific gravity may be increased, since the molecules are forced nearer together.

All metals with the exception of bismuth are lighter when molten than when cold. Bismuth, like water, reaches its greatest density just before solidifying. The relative specific gravities of some common metals in the solid and in the liquid state are shown by the following table, compiled by Sir Roberts-Austen.

The fracture of a metal is not a distinguishing property but an evidential feature which gives much information about the manner in which it cooled, the presence of impurities, etc., and is of great practical value. Thus foundry iron is in many instances still graded and sold by its fracture, and in smelting copper and refining lead the decisive points in the processes are determined by the fracture of test samples. Slow cooling, as with chemical solutions, tends toward the formation of large crystals, giving a coarse fracture, while a sudden cooling may prevent the formation of crystals and thus give a fracture of fine texture. Crystalline structure, which determines fracture, may be affected by repeated shocks or vibrations. In this way the wrought-iron chains on railroad cars to prevent accident in case of a coupler breaking may by the jolting of ordinary service become so crystalline as to break when needed. Very low temperatures, as shown by the experiments of Dewar, also affect in a marked manner the crystalline structure of some metals. Any metal is fusible; though arsenic sublimes at 356° F., it may be fused under the pressure of its own vapor. When heated, metals show a red and finally a clear white color. The temperatures corresponding to these colors are approximately: incipient red, 975° F.; dark red, 1290°; incipient cherry red, 1470°; clear cherry red, 1830°; white, 2370°; dazzling white, 2730°.

METAL	Sp. g. of solid	Sp. g. of liquid
Iron (pig)	6.95	6.880
Zinc	7.20	6.480
Tin	7.50	7.025
Copper	8.80	8.217
Bismuth	9.82	10.550
Silver	10.57	9.510
Lead	11.40	10.370

The color of a metal depends on its selective absorption of light waves of different wave lengths. Unless the light penetrates the metal, it is all reflected and the metal looks white. The selection of light rays may be from several parts of the spectrum; this is the case with copper which has a reddish hue. Anything which increases the absorption deepens the color. This can be done by reflecting a ray of light many times from two or more surfaces made of a given metal. Silversmiths and goldsmiths accomplish the same result by finely grooving a metal surface. Owing to this absorption of light by a metal the color of the light reflected differs from that transmitted. Thus gold can be made so thin that some light will get through. This light is bluish green, while in reflected light, gold appears yellow. Silver is white by reflected light, while the transmitted light through silver foil is blue.

Malleability is the property that permits a metal to be hammered or rolled into sheets. Ductility that which permits it to be drawn into wire. Both are dependent on the tenacity of the metal, the latter more than the former. The relative malleability and ductility of the principal metals is as follows:

Order	Malleability	Ductility
1	Gold	Gold
2	Silver	Silver
3	Copper	Platinum
4	Platinum	Iron
5	Palladium	Nickel
6	Iron	Copper
7	Aluminum	Palladium
8	Tin	Aluminum
9	Zinc	Zinc
10	Lead	Tin
11	Nickel	Lead

Certain physical constants of some of the metals are shown in the following table:

METAL	Symbol	Atomic weight	Specific gravity	Melting point, °F
Aluminum	Al	27.10	2.6	1217
Antimony	Sb	120.10	6.7	1166
Arsenic	As	74.96	5.7	1560?
Barium	Ba	137.37	3.7	887
Bismuth	Bi	208.00	9.8	520
Cadmium	Cd	112.40	8.6	610
Cæsium	Cs	132.81	1.8	79
Calcium	Ca	40.07	1.6	1490
Celtium	Ct	*	*	*
Cerium	Ce	140.25	6.7	1184
Chromium	Cr	52.00	7.0	2768
Cobalt	Co	58.97	8.5	2690
Copper	Cu	63.57	8.9	1981
Dysprosium	Dy	162.50	*	*
Erbium	Er	167.70	4.7	2282?
Europium	Eu	152.00	*	*
Gadolinium	Gd	157.30	*	*
Gallium	Ga	69.90	5.9	86
Germanium	Ge	72.50	5.5	1756
Glucinum	Gl	9.10	1.8	2370?
Gold	Au	197.20	19.26	1945
Holmium	Ho	163.50	*	*
Indium	In	114.80	7.4	310
Iridium	Ir	193.10	22.5	4170?
Iron	Fe	55.84	7.9	2800
Lanthanum	La	139.00	6.2	1490?
Lead	Pb	207.10	11.4	621
Lithium	Li	6.94	0.6	367
Lutecium	Lu	175.00	*	*
Magnesium	Mg	24.32	1.7	1204
Manganese	Mn	54.93	7.5	2300
Mercury	Hg	200.60	13.5	—37
Molybdenum	Mo	96.00	9.0	4530?
Neodymium	Nd	144.30	6.9	1544?
Nickel	Ni	58.68	8.8	1645?
Niobium	Nb	93.50	7.4	3990?
Osmium	Os	190.90	22.5	4100?
Palladium	Pd	106.70	11.9	2690
Platinum	Pt	195.20	21.4	3190
Potassium	K	39.10	0.86	144
Praseodymium	Pr	140.90	*	1725?
Radium	Ra	226.40	*	1292
Rhodium	Rh	102.90	12.6	3520
Rubidium	Rb	85.45	1.5	80
Ruthenium	Ru	101.70	12.2	4170
Samarium	Sa	150.40	7.7	2460?
Scandium	Sc	44.10	*	*
Silver	Ag	107.88	10.5	1760
Sodium	Na	23.00	0.97	207
Strontium	Sr	87.63	2.5	1110
Tantalum	Ta	181.50	16.5	5160
Terbium	Tb	159.20	*	*
Thallium	Tl	204.00	11.8	576
Thorium	Th	232.40	11.0	3150
Thulium	Tm	168.50	*	*
Tin	Sn	119.00	7.3	389
Titanium	Ti	48.10	3.55	3250
Tungsten	W	184.00	18.64	5430
Uranium	U	238.50	18.69	2730
Vanadium	V	51.20	5.5	3130
Ytterbium	Yb	173.50	*	*
Yttrium	Y	88.70	*	2930?
Zinc	Zn	65.37	6.9	787
Zirconium	Zr	90.60	4.15	3090?

* Not yet (1917) determined. The interrogation point indicates that the figure quoted is approximate.

The mobility of the molecules of a metal is increased by temperature. Thus a coiled nickel wire may be made absolutely straight by suspending a weight from one end and heating the wire to white heat by the flame from an alcohol lamp or Bunsen burner. Zinc at its melting point is brittle, but at a temperature of 150° is quite malleable.

Metals can occlude gases. Thus a given volume of palladium cooled from red heat in hydrogen absorbs 900 times its volume of that gas. Hydrogen passes through red hot iron or platinum, and nascent hydrogen, assisted by atmospheric pressure will pass through a thin plate of cold iron as shown by Deville. A liquid metal can penetrate a solid; a bar of tin rubbed with mercury absorbs enough in a very short time to become brittle. A solid metal may penetrate another when both are cold. This can be shown with plates of gold and lead rolled together and allowed to stand.

For further information about the different metals, see special article under the title of each; as ALUMINUM; ANTIMONY; IRON; LEAD; SILVER, etc. Consult Friend, J. N. (editor), 'Textbook of Inorganic Chemistry' (9 vols. London 1914–17).

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METAMERISM, *in chemistry,* that variety of isomerism in which chemical compounds have identical percentages of composition and also like molecular weight. When two or more chemical compounds have the same empirical formula, but consist of different radicals united by an element (or a radical) that is common to them all, the compounds are said to be "metameric," and the property itself is called "metamerism." The common element that unites the radicals is usually oxygen or nitrogen. Good examples of metamerism are afforded by the compound ethers and amines. Dipropyl ether, methyl-amyl ether, and ethyl-butyl ether, for example, all have the empirical formula $C_6H_{14}O$ but dipropyl ether contains two propyl radicals (C_3H_7), methyl-amyl ether contains one radical of methyl (CH_3), and one of amyl (C_5H_{11}), and ethyl-butyl ether contains one radical of ethyl (C_2H_5) and one of butyl (C_4H_9); the two radicals being connected, in each case, by an oxygen atom. The structural formulæ of these respective compounds are therefore as follows:

Dipropyl ether.	Methyl-amyl ether.	Ethyl-butyl ether.
$\begin{matrix}C_3H_7\\C_3H_7\end{matrix}>O$	$\begin{matrix}CH_3\\C_5H_{11}\end{matrix}>O$	$\begin{matrix}C_2H_5\\C_4H_9\end{matrix}>O$

The following amines, which all have the empirical formula C_3H_9N, illustrate metamerism in which nitrogen is the connecting element:

Propylamine	Methylethylamine	Trimethylamine
$N\begin{Bmatrix}C_3H_7\\H\\H\end{Bmatrix}$	$N\begin{Bmatrix}CH_3\\C_2H_5\\H\end{Bmatrix}$	$N\begin{Bmatrix}CH_3\\CH_3\\CH_3\end{Bmatrix}$

Metamerism may be regarded as a species of accidental isomerism. When metameric compounds are treated with reagents which destroy the bonds between the constituent radicals and the atoms (of oxygen or nitrogen) by which they are united, the several members of the metameric group that is so treated yield totally different products, because they contain totally different radicals.

In zoology, metamerism signifies the repetition of parts in an organized body, as in segmented worms, certain vertebrates, orthropods and lobsters. The meres or segments fall into two classes, those in which the meres repeat with no apparent change and those in which there is modification as the series progresses.

METAMORPHIC GEOLOGY, that branch of geology that deals with the causes and results of metamorphism (q.v.).

METAMORPHIC ROCKS, those rocks of either igneous or sedimentary origin which

have undergone sufficient heat and pressure to be altered into a different kind of rock. In this way limestone becomes marble, sandstone is changed to quartzite, and shale passes over into slate or schist. Metamorphic rocks are usually most abundant in regions of mountains where the rocks have undergone much folding and compression. See MARBLE; QUARTZITE, METAMORPHISM, and the section on *Metamorphic Rocks* in the article on ROCKS.

METAMORPHISM. When rocks of either igneous or sedimentary origin undergo sufficient change so that they largely develop new minerals, and become other types of rocks, they are said to be metamorphosed, and the process is called metamorphism. Such changes may be brought about in many ways. One of the most familiar is the process of weathering (q.v.) by which the minerals of a granite, for example, undergo alteration, the quartz remaining behind as quartz, the feldspar altering chiefly to clay, and the soluble lime, magnesia, potash and soda going to the sea, the first two to form limestone, the latter to produce the salt of ocean water. Thus the complete weathering of a granite and the sorting of the products finally results in the formation of shale, sandstone and limestone. This phase of metamorphism is called katamorphism. It is produced by the atmospheric agencies and results in simpler mineral compounds and rocks.

If on the other hand, a sedimentary rock be subjected to intense heat or pressure, or both, the minerals present recombine to form new minerals, usually more complex, which are better suited to conditions of heat and pressure. This phase of metamorphism is usually called anamorphism. In general usage, the term metamorphism is commonly restricted to what is here termed anamorphism, that is, to those changes due to heat and pressure. The term metamorphic rocks (q.v.) is wholly restricted to rocks which have undergone changes of anamorphic nature. Thus, for example, a shale which has resulted from the weathering of a granite, though it has undergone metamorphism in the broadest sense, is not considered a metamorphic rock.

The heat and pressure which cause metamorphism may be produced by compression and folding over large areas, in which case there is said to be dynamic or regional metamorphis; or they may be due to the intrusion of large masses of highly heated igneous rock (magma), in which case there is said to be contact metamorphism.

Regional metamorphism results largely from pressure, heat is only incidental. The most common minerals to result are those which are flat like mica (q.v.), or elongated like hornblende (q.v.). These naturally develop in parallel arrangement with their smallest dimension opposed to the pressure, that is their larger dimension is at right angles to the compression. This seems to be the easiest way in which such minerals can develop. As a result of this arrangement, such rocks split more easily in certain directions, just as wood splits parallel to the grain. This is called cleavage, and is best manifested in slates (q.v.) and schists (q.v.).

Contact metamorphism, on the other hand, is due largely to heat; pressure plays a less important part. The changes at a contact may be of several types. The rocks may be simply baked or they may be actually fused. The minerals present may recombine to form new minerals. There may be much new mineral matter actually added from the igneous mass, as in the case of contact ore deposits, where ore minerals make up a large part of the contact rock. Or the heat of the igneous mass may drive off substances already present, especially water and carbon dioxide. At most contacts these processes have probably all played a part. The intensity of the metamorphism and the width of the altered zone depends on several factors, such as the size and temperature of the igneous body, the amount of the water or steam present, and the resistance of the enclosing wall rock. A quartzite (q.v.) wall rock may be little changed, while a limestone (q.v.), because of its greater solubility, may be profoundly altered. An abundance of steam aids in producing a marked effect, since it readily works its way out through pores in the rock, carrying much mineral matter. Alteration produced largely by steam or hot water is termed hydrothermal metamorphism. Changes produced by ordinary circulating waters are sometimes termed hydrometamorphism. See CLEAVAGE; GEOLOGY; METAMORPHIC ROCKS; ORE DEPOSITS. Consult Van Hise, C. R., 'A Treatise on Metamorphism,' (U. S. Geological Survey, Mon. XLVII, Washington 1904); Leith, C. K., and Mead, W. J., 'Metamorphic Geology' (New York 1915); Leith, C. K., 'Rock Cleavage' (U. S. Geological Survey, Bull. 239 Washington 1905); Grubenmann, U., 'Die Crystallinen Schiefer.'

METAMORPHOSES. Ovid's 'Metamorphoses,' or 'Transformations,' were published in the year 8 A.D., when the poet was 50 years old. They were finished just before the issue of the imperial order which consigned Ovid to banishment at Tomi on the Black Sea for the remaining eight years of his life. In consternation at the punishment which had overtaken him, he elsewhere tells us that he consigned to the flames his own copy of the poem. But other copies were already in the hands of his friends; it is to these that we are indebted for the preservation of the work.

The poem consists of 15 books in hexameter verse descriptive of the various transformations through which various men and women were conceived to have gone. In the conception of the Greeks almost every river, rock, spring, tree and mountain had attached to it the legend of some such wonderful metamorphosis. Thus the poplar trees are the weeping sisters of Phaëthon; the laurel is Daphne; a spring is Arethusa; etc. The source of this multitude of transformations found in ancient legends is doubtless to be sought in the ancient conception of inanimate objects as animate. Each rock and tree and hill with the Greeks and Romans was a personal being endowed with a spirit. Thus the poplar trees and the fountain and the laurel were regarded as animate to start with; they had not merely become so by receiving the souls of certain men and women. To the vivid imagination of the Greek the waving form of rustling tree or shrub, the moving mass of bubbling or falling water suggested life and individual spirit. The problem was to account for the present form. The inanimate objects represented as the result

of transformations had, accordingly, been conceived as animate from the outset, and the stories of their transformations are merely later inventions devised to account for their primitive conception as personal beings.

Some 250 of the stories belonging to the body of Greek and Roman legend and mythology receive treatment in Ovid's work, which thus becomes a fairly complete treatise on the classic myths. Among the most important of these are the stories of Deucalion and Pyrrha, Daphne, Phaëthon, Cadmus, Semele, Echo, Narcissus, Pentheus, Pyramus and Thisbe, Ino, Perseus and Andromeda, Niobe, Procne and Philomela, Medea, Theseus, Scylla, Daedalus, Philemon and Baucis, Hercules, Orpheus, Adonis, Thetis.

Relatively little space is devoted to the actual metamorphosis in Ovid's poem. The transformation is simply the culmination of a story, generally one of some length. Thus after detailing with great fullness the adventures of the ill-fated Phaëthon with the horses of Phœbus, the poet finally concludes by briefly recounting the transformation of Phaëthon's mourning sisters into poplar trees. So with the other stories; the transformation holds an inconspicuous place, being simply the feature common to all. The different narratives are woven together most ingeniously. There is no break. Each is connected with the preceding and following by some natural link, so that we have one continuous narration from the transformation of the stones of Deucalion and Pyrrha into men to the transformation of Julius Cæsar into the comet which appeared after his death. By the poet's fiction, therefore, the treatment is made to assume the illusion of chronological sequence. In the last books Ovid approaches the legends of the Trojan cycle and of early Roman history, gradually bringing the reader to the events of his own day.

With great artistic skill the poet varies the manner of presentation. The larger part of the stories are his own narration, but monotony is avoided by resort to other devices. Thus a number of legends are put in the mouth of Orpheus. Others are recounted by the three daughters of Minyas to while away the time as they sit at their spinning.

The 'Metamorphoses' is Ovid's masterpiece and has always enjoyed high favor. The poet's own faith in his work is indicated by the concluding verses of the final book, in which he gives free expression to his confidence in the immortality which he feels it has won for him: "Over the stars his name shall soar; as far as the Roman dominion reaches his work shall be read, and it shall live for all eternity."

The most recent translation is by F. J. Miller in the Loeb Library.

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METAMORPHOSIS IN ANIMALS, the changes which in many animals take place between the time of birth and maturity. The causes are most probably changes of habitat, of seasons, of food and the acceleration in growth resulting from the approach of sexual maturity. Familiar examples are the change of the caterpillar into the butterfly, of the tadpole into the toad or frog.

In the frog and toad, metamorphosis is complete and thoroughgoing. The embryo on hatching from the egg has a large head and body, but no tail; in a few days its tail grows out and it becomes a tadpole, when it is fish-like but without fins or limbs. With the growth of the tail, the external gills appear, and the mouth is formed, while the intestine becomes very long and closely coiled. The mouth is armed with horny, comb-like plates, on which develop great numbers of microscopic teeth which are shed continuously. In changing from the tadpole to the toad or frog, the body, including the skull and rest of the skeleton, and the viscera are made over anew; the external gills disappear as the lungs develop, the true teeth appear in the jaw, the intestine becomes short and straight, and the creature instead of nibbling decaying leaves or dead animals feeds on living snails and insects. Soon the tail becomes absorbed, finally the hind legs grow out, the gills disappear, the front legs bud out and the adult form is attained. While most amphibia pass through such a metamorphosis, in a few forms, owing to the absence of water or other changes in the environment, development is direct, the metamorphosis being suppressed. Metamorphosis may be retarded by cold and shortened by hunger, and in the amphibians or in insects the changes are greatest in modern and specialized forms, as frogs and toads.

The metamorphosis of the butterfly is the most complete of those of all insects. The life of the insects is divided into four stages, that is, the egg, larva, pupa and imago or adult. During the larval and pupal periods the insect is, so to speak, a different animal from the adult. The caterpillar is provided with big jaws and eats voraciously; in shape and structure it differs widely from the winged adult. The pupa or chrysalis is also different from the larva, and also from the imago; it takes no food and rests almost motionless. On the other hand, the butterfly has no jaws, while its maxillæ form a long coiled-up tongue, beautifully adapted for probing the corollas of flowers. Though these changes appear to be sudden, the internal alterations of cells and tissue which lead to them are gradual. From one to three days before assuming the pupa state the caterpillar becomes restless and stops eating. If a spinner it spins a cocoon, or if not it enters the earth to undergo its transformation into a chrysalis, or if a larval butterfly it attaches itself to some fixed object, as a tree or fence. Profound changes now take place in the mouth-parts as well as the nervous, muscular and other systems of internal organs.

But the changes are most marked in the flesh flies and their allies. At the end of the maggot stage, the internal organs are destroyed, breaking up and forming a creamy mass, and the appendages and wings arise from minute internal masses of cells called "imaginal buds" which are present in the maggot. The body is thus entirely made over anew. But while the process of destruction of the larval organs and appendages goes on, there is also a constructive process, during which the organs of the adult state are being built up. It is thus evident that the sharp division of the life-history of the insect into larval, pupal and imaginal stages only applies to the external surface of the body. The internal processes of development, on the other hand, form a continuous series of transformations between which is no sharp line of demarcation. Yet as a whole the form of the

larva, pupa and imago are kept distinct in adaptation to their separate environments and habits.

Hypermetamorphosis.— This name is applied to the changes undergone by certain beetles (*Meloë, Stylops*, etc.), in which there are more than the usual number of larval and resting or pupal stages. Thus, in the common oil-beetle (*Meloë*) and in the blister-beetles (*Epicauta*), the larva hatches as a minute, active, triungulin creature which is a parasite in bees' nests, feeding on their eggs; it passes into a second larval stage, when it is grub-like, inactive, the body being thick, cylindrical, soft and fleshy; this passes into a motionless semi-pupa, and thus after molting assumes a footless larval form; it then transforms into a true pupa like other beetles. There are thus four distinct larval stages, besides the pupa and beetle. Now these stages correspond to the habits and food of the young beetle, and these supernumerary stages and marked changes of form are evidently due to changes of environment, of habits and of food, resulting in the atrophy of limbs in certain stages. This throws light on the causes of metamorphism in general.

No Distinct Metamorphosis in the Primitive Insects.— The wingless insects (*Synaptera*) do not pass through a metamorphosis. And it appears, as first suggested by Fritz Müller, that the habit of metamorphosing is an acquired one. Thus in the more primitive winged insects, such as the cockroach, grasshopper, bugs, etc., metamorphosis is incomplete, the young differing mainly from the adult in not having wings. Also the most primitive arthropod animals, such as the horse-foot crab (q.v.), the spiders and myriapods, pass through no metamorphosis.

Metamorphosis in the Lower Animals.— The more specialized cœlenterates (*Medusæ*), the echinoderms, mollusks and crustaceans, as well as many worms, undergo remarkable changes of form. (See LARVA). The larva of the marine annelids is a top-shaped ciliated creature (*trochosphere*) entirely different from its parent. The marine mollusks pass through a larval condition (*religes*). The young of the sea-urchin, star-fish and holothurians differ remarkably from their parents in being bilaterally symmetrical, transparent and free-swimming; they serve as scaffoldings from which the body of the adult is developed. The shrimps, etc., are hatched in a nauplius or six-legged form, and crabs in a zoëa form.

METAPHOR, a figure of speech expressed in a single leading word; a similitude — for example, "The man is a lion," is a metaphor; "The man is as bold as a lion," is a simile. Metaphor is an ideal characterization or illustration which may be affirmed by one mind and denied by another, or affirmed and denied by the same mind at different times; it is a kind of comparison in which the speaker or writer rejects the circumlocution of the simile and attains his end immediately by establishing the identity of his illustration with the thing spoken of. It is thus of necessity, when well conceived and expressed, graphic and striking in the highest degree, and has been a favorite figure with poets and orators and makers of proverbs in all ages. Even in ordinary language the meanings of words are in great part metaphors; as when we speak of an *acute* intellect or a *bold* promontory: all such words are *in metaphor*, and the *language* may be called *metaphorical*.

METAPHOSPHORIC ACID. See PHOSPHORIC ACID.

METAPHYSICAL DETERMINISM. See DETERMINISM.

METAPHYSICS (from Gr. *Meta ta phusika*, "after physics," alluding to the position of Aristotle's treatise on metaphysics in his works). Metaphysics and epistemology (q.v.) are the twin sciences of the nature of reality and of our knowledge thereof. Metaphysics seeks for the criteria of being, epistemology for those of truth. As the truth is generally conceded to possess some peculiarly intimate relation to reality which is not found in the case of error, and as our sole avenues of access to reality are those of experience, be it sensory, rational, emotional or volitional, the boundary line between epistemological and metaphysical opinions is of the most obscure and wavering nature, so that a separate study of the two disciplines is exceedingly unprofitable. We shall accordingly shift our standpoint continually from that of one science to that of the other.

Metaphysics is not a subject which one can study or refuse to study at will; whether it is explicit or not, there is always some criterion of truth, of reality, that permeates our barest common sense. This may be metaphysically inadequate, but must be metaphysical. When I draw a distinction between a dream and an experience of waking life, between a truth and a lie, between a fact and an error, I am drawing a metaphysical distinction. When a physicist reduces the table before him to a vast aggregate of electric charges, or asserts the basic identity of time and space, or interprets light a transverse electromagnetic vibration, he is nothing if not metaphysical, for he is drawing a distinction between the appearance of things and their underlying reality. Even those who claim to be agnostics or sceptics in the professor's chair are tainted with metaphysics in their daily life, for the only agnosticism, the only scepticism which can free itself from all blemish of metaphysics is an agnosticism, a scepticism so complete that it does not even tentatively maintain any criterion of reality or unreality, of truth or falsity.

We have accordingly three stages of metaphysics to discuss: (1) the metaphysics of common sense; (2) the metaphysics of the natural scientist; (3) the metaphysics of the technically trained philosopher.

(1) The Metaphysics of Common Sense. — The average philosophical layman, be he educated or not, believes that the wall he sees in front of him, the cane that he holds, the song that he hears are real, with an immediate and underived reality. He is confident that the wall, the cane, even the song would be the same with nobody to experience them. He is also confident that he exists, and that his existence is utterly independent of any experience he may have. Now, this view that the object is out there and I am in here, and that seeing is something which needs no analysis (for so the layman believes), works remarkably well providing I only see things that are so. It is, however, clear that in my dreams and other illusions I frequently see things that in some

manner are not so. If seeing is an immediate relation between me and my object, what is my object when I dream of something which, in every common-sense interpretation of the words, does not exist?

This is obviously the highest common factor of metaphysics and epistemology, for it unites the fundamental questions of the two sciences, the question of truth and that of reality. What is more, it is in essence the one cardinal problem of both sciences, the great problem of error. The problem of error may be approached from two different angles, according as there are supposed to be real entities which form the objects of erroneous experience, or no such entities at all. In the latter case, experience must be interpreted as not essentially a subject-object relation. As we shall see, practically all the earlier modern philosophers hold that erroneous experiences have objects. The second alternative is indicated in Spinoza and appears in the philosophies of Kant and Hegel.

(2) The Metaphysics of Natural Science. — Of course, science as such can have no peculiar metaphysics, for the truth is essentially one — unless we adopt the pragmatist attitude — and cannot be changed into a falsehood merely by looking at it through the spectacles of a particular discipline. Nevertheless, there is a certain conventional metaphysics which may be read between the lines of the majority of scientific textbooks, the habitat of which is the laboratory and the specimen-box. Though this may be traced to the Greeks, it owes its incarnation in its present avatar to Descartes and Locke. Both these writers, who are conventionally called dualists, since they believe in the essential distinctness of mind and matter, are really rather what one might name ternarists, inasmuch as they posit between the self and its objects a third class of entities, the ideas, by the mediation of which the mind or self is aware of the outer world. Dreams differ from true waking experiences in that the ideas they contain have no realities corresponding to them. Modern science has turned the real universe into a world of movements of material particles, or of electric charges, without any intrinsic color or sound, and has relegated these latter qualities to the realm of ideas. The physical correlates of these ideas are, of course, particles or charges in motion. By the mediation of the nervous system these particles or charges and their movements are supposed to produce certain alterations in the brain — Descartes considered that they were in the pineal body, while the advance of modern science has placed them in the cerebral cortex — which have as invariable concomitants certain ideas or ideational processes. It is these that form the sole direct object of human inspection.

This theory is perfectly successful in explaining error, but remarkably inadequate in accounting for anything else — any knowledge, that is, which is not a mere accidental blundering belief. The situation is quite analogous to that of a man gazing at the cover of a book and trying to know what is inside. This knot or rib in the cloth *may* cover an exposition of this or that theory, but if the book is permanently locked up, and is opaque, we can never know this. We consequently find that at the very beginning additions and modifications were made in the theory. These, however, belong to

(3) The Metaphysics of the Technical Philosopher. — Modern philosophical tradition may be said to commence with Descartes. Accordingly, he is the first man with whom the metaphysical issues of the present day receive the division and treatment with which we are familiar. We have seen that he divided the world into separate realms, apparently of mind and matter, but really of soul, matter and ideas. Nevertheless, he saw the difficulties of the problem of error and tried to give it a more adequate solution than that pertaining to the conventional philosophy of natural science. As the founder of modern mathematics he tried to introduce mathematical criteria of truth into metaphysics, and so he starts with the proposition, "I think, therefore, I am," the denial of which he regards as self-contradictory in the same sense in which "2 has a rational square root" is self-contradictory. Having thus obtained the existence of the self, he goes on to demonstrate that God exists: "I have an idea of a most perfect Being, and this idea can only come from the Being with the one perfection my idea lacks, that of existence." Once he has got this Being, Descartes asserts that our knowledge of matter receives its guarantee in the honesty of God. This relieves the difficulty we encountered in the metaphysics of the scientist, the difficulty of bringing ideas and their objects into relation, but it is not by any means completely satisfactory. If God is honest, how can we make blunders? By failing to have our ideas clear and distinct, says Descartes. But how can an honest God permit vague ideas? This involves us in the interminable and fruitless controversies concerning the relative power and goodness of God which were so characteristic of the mediæval schoolmen at their worst.

Descartes' philosophy thus involves a *Deus ex machina*. His followers, without exception, laid far more emphasis on this phase of his philosophy than he himself. In the systems of Geulincx and Malebranche, God becomes the agent causing every change in mind and matter, who for each change in the one wills that there shall be a corresponding change in the other. From this Occasionalism it is but a step to the monism of Spinoza, for whom mind and matter are but two among an infinite number of aspects of the one reality, God. From another standpoint, the entire world is the content of intellection, without the mediation of the Cartesian and Lockean "ideas." Spinoza retains the logical, mathematical, intellectualistic standards of truth and knowledge which were set up by Descartes, but he has also a mystical, emotionalistic view of the nature of reality, in that he believes that this is most truly perceived through the Intellectual Love of God.

The *Deus ex machina* survives in the views of the next great continental philosopher, Leibnitz. Instead of the two substances, mind and matter, of the Cartesian tradition, he supposes an infinity of substances, the monads, all partaking to some extent of a mental nature. In place of calling upon God's continual intervention to keep these experiences in accord with the facts, Leibnitz supposes that at the Creation the Lord foreordained that all these many experiences should keep time, just as two perfect clocks, wound up and set together, will agree

on all subsequent occasions until they run down. It will be seen that the problem of error appears in the philosophy of Leibnitz almost in its Cartesian form.

Leibnitz regarded the monads as possessing ideas of various grades of clearness and distinctness, and believed that matter was made up of those with the vaguest ideas. Because he considered matter to be of the nature of mind, Leibnitz is called an idealist, and is classed together with Berkeley, whom we shall next consider. By observing the vast distance that separates the philosophies of these two men, it will be possible to see how little content inheres in this term, which, with its contradictory realism, has been singled out by a certain American philosophical school as the index of a grand dichotomy of all philosophical systems.

Berkeley belongs to the British empiricistic tradition. His immediate philosophical ancestor is Locke. Unlike Locke, however, Berkeley saw that no object not directly given can furnish a test of empirical reality, nor an aid in its explanation. Accordingly, his world consists of selves and their ideas or sense-data. This does not mean that he rejected natural science, but that he insisted that all its propositions were capable of expression in terms of ideas. Such ideas as are not immediately given to any person he considered to reside in the mind of God, one of whose functions it becomes, to put it crudely, to watch things when nobody is looking and to see that they do not vanish away. However, it will be noticed that an idea in the mind of God which is not experienced by us is as inert, remote and useless from an explanatory point of view as a bit of matter. Furthermore, the self apart from its ideas does not appear to play any great part in knowledge. Given an experience, nothing more seems to be added by the adjunction of the self. For these reasons, the next successor to the British tradition, David Hume, rejected both the Berkeleyan matter — thinking God and the soul as a specific entity, and interpreted the world purely and simply as an aggregate of sense-data.

We thus see the contrast between the natural-scientific and the Humian view of the universe; for the naïve scientist, a bit of experience is really an aggregate of atoms in motion, whereas for Hume an atom in motion would have to be interpreted in terms of bits of experience. Unfortunately, Hume possessed neither the scientific knowledge nor the logical mechanism to carry out this process in any but the crudest and most schematic way, and his philosophy of space, time and causality is in detail as bare and inadequate and unsatisfactory as any yet devised. Recently, however, Bertrand Russell, who is essentially a Humian in spirit, though he adopts the independent nature of the soul as at any rate a plausible hypothesis, has developed a treatment of these subjects, and of many other allied ones, which is at once scientific and at bottom after the manner of Hume. Matter, for instance, is treated as the system (Hume would have erred by saying "the sum") of its appearances; an atom or electron becomes a class of sense-data or a relation between them, or something of this general nature. The scientific analysis in terms of atoms and electrons is recognized as valid, but as based on a deeper analysis into the experiences out of which atoms and electrons are artefacts.

This recrudescence of British empiricism, however valid its opinions and valuable its results may be, is off the main stream of philosophical development during the latter part of the 18th century and the entire 19th. This main stream has its source in Kant, who, to continue the metaphor, marks the junction of the currents of British and of Continental thought. What is most distinctive in the thought of Kant is his definite and final occupation of the standpoint of epistemology, as the true ground for the determination of the problems of metaphysics. Now in so doing, Kant is making thought the measure of reality, and this seems to be only repeating the judgment of Spinoza. But there is a great difference. Kant declines to accept Spinoza's doctrine of thought and reality. The real is more than the content of thought. In fact Kant returns to the ancient intuition of thought as formal, and the real as in some sense its correspondent. This was also the tradition of Locke and his school, from which Hume departed, as we have seen, with a result that is often called scepticism. Now the history of Kant's thought shows that, while he clung to the belief in the mere formal character of thought, his tendency was also strongly in the direction of scepticism. Moreover it was on account of his failure to completely achieve what he calls his Copernican revolution, and which was in fact a reaction toward a constitutive doctrine of thought, that he was never able, during the whole of his critical period, to reach a satisfactory conception of the relation of thought to reality. Had Kant completely achieved the mental revolution he proposed, the result would have been, that in epistemology he would have asserted the doctrine of Spinoza, the identity of the real with the content of thought. The knowable world would thus have been identical with the real world and Kant would have escaped the dualism between knowledge and reality into which he actually fell. Kant also denies the universality of thought; at least in the ontological sense. The thought that functions epistemologically is my human relative thought which can only pronounce judgments that are subjectively valid for me, but have no ontological value for reality. The Kantian metaphysics is a corollary from his epistemology. What Kant calls critical idealism is first an epistemology, secondly a metaphysic. As an epistemology it teaches that my thought is constitutive for me; that is, that its content is valid for my subjective connation. It gives me a world, in other words, in which I can work out the practical issues of my life, but it does not give me the world of real things in themselves with respect to which my attitude must be one of renunciation. As a metaphysic critical idealism simply carries its program out in the field of ontology. The presumption of the identity of what is thought with the real cannot be carried out objectively. Kant's metaphysics is therefore necessarily negative. Thought is able to complete itself ontologically, it is true, but the ideals it reaches have no other than subjective value. Their hypothetical content can never be identified with the real, and the Kantian is per force obliged to represent the whole ontological region as an indeterminate X and to look for

the satisfaction of his wants to extra-metaphysical forces. These he finds in the domain of ethics.

In Hegel we have also an example of a thinker who approaches metaphysics along the epistemological way. But Hegel is a much more thoroughgoing thinker than Kant. He starts no doubt with the Kantian traditions in mind and his first great task, the development of his logic, is formal. But Hegel is not a formal thinker, in the sense that he divorces content and form. Thought is formal. This Hegel is not afraid to confess, but it is also ontological. At the same time there are no outlying realities, like the Kantian things in themselves. How is this? Are we to have the spectacle of a lapse into Spinoza? Our apprehensions are ungrounded, for Hegel asserts calmly that the form creates the content. Hegel asserts the identity of thought and reality in the sense that the real is, and is only, what the thought thinks it to be. It is the real by virtue of the thought thinking it to be. This sounds like a dangerous kind of subjectivity, till we learn that by thought Hegel means, not my thought or yours, as simply my or your intellectual function, but the thought that is universal and that thinks the universal. So much for Hegel's epistemology. In Hegel's system epistemology and metaphysics are simply two aspects of the same thing. In epistemology we have the system logically conceived; that is in view of the process which the finite thought of the individual must pass through in order to apprehend it; whereas in the metaphysics we have the system presented in its unity as a self-completing whole. Epistemologically the dialectic is the movement by which results are achieved; metaphysically it is the Divine Spirit of the system as a whole. Error is accounted for precisely by the disparity between individual and universal thought.

One of the most remarkable aspects of the metaphysics of the past century is the strong voluntaristic or emotionalistic trend which is to be observed among writers of the most different philosophical ancestry. Schopenhauer, though in many ways a follower of the Kantian tradition, interpreted the course of events as the manifestation of a world-will, which performs the functions of the Kantian thing-in-itself. This will manifests itself in man as will in the ordinary sense, while in matter it is seen as force. A view which displays an analogous voluntaristic or rather activistic trend, though in every other respect most unlike that of Schopenhauer, is pragmatism, the chief exponent of which was the American philosopher, William James. This view states that the truth of a theory or the reality of a system is not merely determined but constituted by what is in some sense the ease with which it can be applied and the value of the results of this application. A similar position is that of Henri Bergson, who maintains that the analysis of science yields us only half-truths, while the real nature of the world is shown to us by intuition, which exhibits it to us as the working of a certain vital impulse.

There is no metaphysics at the present time which can lay claim to a general acceptance. The 19th century domination of all philosophy by the memories of Hegel and Kant is passing away, and the tendency of worshiping these great men as philosophical demigods is well-nigh extinct. Their followers, numerous though they are, must dispute their realm with the modern critical adherents of the British tradition, armed with modern logic, mathematics and science, and with the pragmatisto-Bergsonian tendency.

Before closing this article, let there be a word of caution to the reader against that facile metaphysical criticism which depends on labels. We have already seen that the line of cleavage between idealism, or the view that all things are either thoughts or their thinker, and realism, which asserts the existence of other entities, does not of itself mark one of the great philosophical dichotomies; Berkeley, the first typical British idealist, and Leibnitz, the idealist of the Continent, both, fall into the epistemological difficulties which are generally accepted as characteristic of realism, in that the problem of the relation between the knower and the known remains in what is essentially the Lockean or Cartesian stage. The distinction between spiritualism, which is almost a synonym of idealism, is that it regards matter as constituted of psychical material, and materialism, which analyzes mind in terms of matter, is similarly not a touchstone to the real nature of the views which it denies. The only really satisfactory method of metaphysical criticism is by the careful individual analysis of each philosophical system according to its own concepts. See EPISTEMOLOGY; PHILOSOPHY; PHILOSOPHY, HISTORY OF; and the articles on the individual philosophers mentioned.

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METASOMATISM. According to the United States Geological Survey, "Metasomatism may be defined as the process by which, through chemical interchange, a mineral or aggregate of minerals undergoes partial or

complete change in chemical constitution." More simply stated, metasomatic ore bodies are formed when the ore substance replaces the rock particle by particle, instead of filling already existing cavities. Replacement is frequently used as a synonym for metasomatism, and ore bodies so formed are usually called replacement bodies. Replacement, unfortunately, is used loosely by some writers, to indicate cavity filling, and these authors use the term metasomatic replacement in the same sense in which others use the term metasomatism. According to the most careful usage metasomatism and replacement are synonyms, and apply to ore bodies replacing the wall rock particle by particle. "Metasomatic replacement" is then pleonastic.

METASTASIO, Pietro, pē-ā'trō mā-tās-tā'-zē-ō (properly PIETRO TRAPASSI), Italian poet: b. Rome, 13 Jan. 1698; d. Vienna, 12 April 1782. His poetical talents were early displayed in improvisations, and often he drew about him a crowd to listen to some versified narrative. The jurist Gravina, who thus accidentally became acquainted with his talents, took him under his protection, called him (by an Italianized translation of his name into Greek) *Metastasio,* paid great attention to his education, and on dying in 1717 left him an estate of $20,000. On 15 April 1718 he was received into the Arcadian Academy with the name of Artino Corasio, and in 1720 entered at Naples the office of the attorney Castagnola, who discountenanced literary work, and kept him severely to the law. He wrote anonymously 'Gli Orti Esperidi' (1722), but the authorship was soon revealed, and Metastasio left the lawyer's office, studied further, and wrote a series of musical dramas, or melodramas in the true sense, which were set by leading composers and given with great success. In 1730 he settled in Vienna as court poet, and there in 1730–40 wrote his best works, 'Demetrio,' 'Issipile,' 'Demofoonte,' 'La Clemenza di Tito,' 'Attilio Regolo.' In the consideration of Metastasio's rank as a poet, his work must be viewed not absolutely, but with regard to its original environment, as done in collaboration with a composer, and rendered by great artists. He wrote, too, for the predominantly vocal system of Italian musical drama; and with this his poetry fell into comparative neglect. His writings have been praised by so good a critic as Symonds for excellent versification, ease of diction, effective simplicity of construction and frequent imagery of the highest rank. His lyrical verse and criticisms are also of value. The best collected edition of his works is that of 1780–82 (Paris). Consult Massafia, 'Pietro Metastasio' (1882); also Lee, 'Studies of the 18th Century in Italy' (new ed., 1908).

METASTASIS (1) *in medicine,* a change in the seat of a disease, attributed to the translation of morbific matter to a part different from that which it had previously occupied, or to the displacement of the irritation. Mumps is a disease peculiarly liable to induce metastasis. In adult males the inflammation often goes to the testicles, producing orchitis, and in adult females to the breasts or ovaries, in the latter case ovaritis. Mastoiditis often results in similar shifting of the inflammation by the travel of blood clots, and the inflammation may reappear in any of a dozen places. (2) *In botany,* a change produced upon a substance designed for the nutriment of a plant, to make its assimilation more easy. Thus, when the starch formed in the leaf of a potato has to be transferred to the tubers as a depot of nutritial material, it is first changed into a soluble substance — glucose. See METABOLISM.

METATE, the stone implement on which grain and other substances, more especially corn, were ground before the discovery of America and are still ground throughout the territory of the United States occupied by the Pueblo Indians, and in Mexico, Central America and much of South America, more especially the west coast. See MORTAR.

METAURUS, mę-tâ'rŭs, or **METAURO,** mā-tow'rō, Italy, a river in the Marches, which flows northeast past Saint Angelo in Vado, and falls into the Adriatic, southeast of Fano; total course, about 50 miles. It is noted for the victory gained by the Romans under the consuls Claudius Nero and Livius Salimator near its banks over the Carthaginians under Hasdrubal 207 B.C.

METAVOLTINE. A sulphur-yellow mineral occurring in aggregates of hexagonal scales at Madeni Zakh, Persia. Dichroic. Hardness, 2.5; specific gravity, 2.53; composition: Sulphuric acid, 46.90; sesquioxide of iron, 21.20; protoxide of iron, 2.92; potash, 9.87; soda, 4.65; water, 14.58. Much of the mineral called misy belongs to this species.

METAYER, mĕ-tā'yer, Fr. mā-tā-yā (L. Latin, *medietarius*), a name given in France to the cultivator of a *metairie* or farm who reserves for himself one portion of the produce as the price of his labor and gives the proprietor the other, which represents the rent of the land after deducting what is necessary to keep up the stock. The greater part of the centre and south of France, and almost the whole of Italy, is cultivated by metayers, who are in general upright, economical and industrious. This system of farming on shares, usually half and half, has been tried to some extent in the southern United States, but has never been popular either with farmer or tenant. The tenant is inclined to let the farm run down, because of uncertainty that he will have it in following years. The system also seems to work against the introduction of improved machinery. See AGRICULTURE IN THE UNITED STATES.

METAZOA, one of the two great sections into which Huxley divides the animal kingdom, the other being the Protozoa. The Metazoa embrace all animals composed of more than a single cell, that is all that develop through eggs or ovum. The *Porifera* or sponges are the lowest of the Metazoa. See ANATOMY, COMPARATIVE; PROTOZOA.

METCALF, William, American steel manufacturer: b. Pittsburgh, Pa., 1838; d. 1909. In 1858 he was graduated at the Rensselaer Polytechnic Institute, Troy, N. Y., and from 1860 to 1865 supervised the manufacture of Rodman and Dahlgren guns at Fort Pitt, Pittsburgh. In 1868 he entered the steel manufacturing field and in 1898 organized the Bræburn Steel Company, of which he was president for 11 years. It is said that Metcalf made the first crucible steel in America. He was president of the

American Institute of Mining Engineers in 1881 and of the American Society of Civil Engineers in 1893. He published 'Steel—A Manual for Steel-Users' (1896).

METCALFE, Samuel L., American physician and scientist: b. near Winchester, Va., 1798; d. 1856. In 1823 he was graduated in the medical department of Transylvania University; established a medical practice at New Albany, Ind., and visited England in 1831. Upon his return to his native country he made a geological tour in Tennessee, North Carolina and Virginia. Later he settled in New York where he took up scientific work. He published 'Narratives of Indian Warfare in the West' (1821); 'A New Theory of Terrestrial Magnetism' (1833); 'Caloric: Its Mechanical, Chemical and Vital Agencies in the Phenomena of Nature' (2 vols., 1843; 2d ed., 1859).

METCHNIKOFF, Elie, Russian bacteriologist: b. Kharkoff, Little Russia, 15 May 1845; d. Paris, France, 15 July 1916. Following his education at Kharkoff, Metchnikoff studied at Giessen and Munich, and in 1870 he was appointed professor of zoology at Odessa. He held this post until 1882, when he resigned to devote himself to private researches into the anatomy of invertebrates. It was while working at lowly organized forms of life such as sponges that he first made the observations which constituted the basis of all his subsequent work. In 1888 he had attracted the notice of Louis Pasteur, the founder of the famous Pasteur Institute for the treatment of rabies, in Paris, and he was invited to become one of Pasteur's associates. In 1895 he succeeded as the director of the institute, a post which he held to the time of his death. In his study of longevity, Metchnikoff came to the belief that it should not be uncommon for persons to live to the age of 150 years. He found every indication that the human mechanism was calculated to last far longer than it actually does. His researches showed among other things that animals which had no large intestines lived to an advanced age, particularly birds, which preserve their youthful agility and spryness to the end of their long span. In the case of human beings he found that even among those whose sufferings were terrible, there were few who wanted to be put out of their agony by death. They all wanted to live. If the normal specific longevity were attained by human beings he believed that old and not degenerate individuals would lose the instinct for life and acquire an instinct for death and that as they had fulfilled the normal cycle of life, they would accept death with the same relieved acquiescence as they now accept sleep. On his seventieth birthday, in 1915, Professor Metchnikoff received a present of a golden book, forming a unique record of the latest scientific researches, signed by men of science of the day. Although there was much controversy in the scientific world regarding his original ideas, he was fully recognized as one of the most eminent bacteriologists. In 1908 the Nobel prize for medical research was divided between the late Dr. Paul Ehrlich, of Berlin, and Professor Metchnikoff. The $20,000 which he thus received he devoted entirely to the furtherance of his scientific researches. Personally he was not well-off, and throughout his long life sacrificed all but the plainest living necessities to the cause of science. He was the author of a number of books including 'Lectures on the Comparative Pathology of Inflammation' (London 1893); 'Immunity in Infective Diseases' (New York 1905); 'Etudes sur le nature humaine; essai de philosophie optimiste' (1903). English translations of his lectures are 'The New Hygiene' (Chicago 1907); 'The Nature of Man' (New York 1910). He edited, with Sacquépée and others, 'Médicaments microbiens, etc.' (1909). Consult 'Annales de l'Institut Pasteur' (Paris), and Slosson, E. E., 'Major Prophets of Today' (Boston 1914).

METELLA, Cæcilia, daughter of Metellus Creticus. Her tomb is the best known of the many that once lined the Appian Way for some miles beyond the walls of Rome, because of the law which forbade burial within the city limits.

METELLI, mē-tĕl'ī, a Roman family of the *gens Cæcilia.* QUINTUS CÆCILIUS METELLUS MACEDONICUS defeated the Achæans, took Thebes and invaded Macedonia, etc., and received a triumph 146 B.C. QUINTUS CÆCILIUS METELLUS NUMIDICUS rendered himself illustrious by his successes against Jugurtha, the Numidian king. He took, in this expedition, the celebrated Marius (q.v.) as his lieutenant, was soon recalled to Rome, and accused of extortion and ill-management, but was acquitted of these charges. He celebrated a triumph at Rome 107 B.C. His son, QUINTUS CÆCILIUS METELLUS received the surname of PIUS on account of the love which he displayed for his father when he besought the people to recall him from banishment in 99 B.C. In 83 B.C. he joined Sulla, with whom, three years later, he was united in the consulship. QUINTUS CÆCILIUS METELLUS CRETICUS conquered Crete, and reduced it to a Roman province in 67 B.C. QUINTUS CÆCILIUS METELLUS PIUS SCIPIO, the adopted son of Metellus Pius, in 52 B.C. was colleague in the consulship with Pompey, who had married his daughter Cornelia. Hence he exerted himself to the utmost to destroy the power of Cæsar and strengthen that of his son-in-law. He commanded the centre of Pompey's army at the battle of Pharsalia, and thereafter fleeing to Africa was defeated by Cæsar at Thapsus 46 B.C. He died by his own hand.

METEMPSYCHOSIS. This ancient theory has at times been confounded with reincarnation. While both imply that man lives again the propositions present radical differences. See REINCARNATION; TRANSMIGRATION.

METEORIC WATER. See GROUND WATER.

METEORITES, also called AEROLITES, METEORS and METEORIC STONES, are bodies that enter the earth's atmosphere from without and, being intensely heated by impact with the air, are partially consumed before reaching the ground. If the fall occurs at night, the meteorite is seen as a ball of fire passing over the heavens and frequently leaving a brilliant train of material behind it; usually sparks and fragments are thrown off from the head, and sometimes this bursts in pieces with a loud explosion and finally reaches the ground in hundreds, or even thousands, of pieces. If not too far away from the observer, its passage through the air may be heard as a continuous

roaring sound accompanied by frequent detonations of great volume; if a final, louder explosion is both seen and heard, the distance from the observer to the meteorite at the time may be very accurately determined by the consideration that sound travels but 1,040 feet a second while the transmission of light is practically instantaneous. The reader who is fortunate enough to witness a meteoric fall should therefore take means to estimate the number of seconds which elapse between when the explosion is seen and when the sound reaches him. This is usually done by beginning to count, or to repeat the letters of the alphabet, or some piece of doggerel at the first instant and breaking off at the second. By a repetition immediately afterward, which is timed by a watch, a quite accurate approximation will be obtained. If in addition the apparent position of the meteor among the stars is noticed at the beginning and end of its appearance or (if the phenomenon is witnessed in the daytime) if the approximate bearing and elevation above the ground are noted at the two instants, the time being also stated, at least approximately, the observer will have secured a record which will be of real scientific value.

Meteorites are of two classes — the stony meteorites and the iron meteorites. The former are about 10 times more numerous than the latter. In the iron meteorites iron usually forms more than 90 per cent of the entire mass, but it is almost invariably alloyed with nickel. In the stony meteorites mineral combinations occur which are peculiar to these bodies, and serve as one of the ear marks by which they may be recognized when they were not seen at the time of their fall.

Other distinguishing marks of meteorites are found in their physical appearance and structure. They are covered with a blackish crust formed by surface melting during their passage through the air. This crust consists mainly of oxide of iron, and is magnetic. Pits and hollows are formed in the surface of a meteorite by the fusing of the less refractory minerals and these are a characteristic feature.

When a portion of the surface of an iron meteorite is polished and then etched with acid peculiar markings, called from the name of their discoverer Widmannstatten figures, make their appearance. These are among the most trustworthy criteria of the meteoritic origin of suspected masses of native iron.

About one-third of the chemical elements known in the laboratory have been found in meteorites. But no new element has ever yet been discovered in them. The following elements occur, in greatly varying quantity, sometimes a mere trace being present:

Iron	Carbon	Oxygen
Nickel	Sulphur	Hydrogen
Cobalt	Phosphorus	Nitrogen
Copper	Silicon	Chlorine
Aluminum	Sodium	Chromium
Tin	Calcium	Titanium
Magnesium	Potassium	Lithium
Arsenic	Manganese	Helium

As the true nature of shooting stars was not understood until after the investigation that followed the great shower of 1833, so the true nature of meteorites was recognized only after a remarkable fall of those bodies which occurred at L'Aigle in France about noon on 26 April 1803. Nine years before, in 1794, Chladni, a German physicist, had formulated the theory that meteorites before encountering the earth traveled in independent orbits in space, but his conclusions were not generally accepted until the occurrence at L'Aigle had focused the attention of men of science. On that occasion between 2,000 and 3,000 meteoric stones were scattered over an area about nine miles long by three miles wide. The French astronomer, J. B. Biot, visited L'Aigle, carefully examined the fallen stones and collected and discussed the evidence of eye witnesses. Thereafter the old idea that meteors and meteorites were simply atmospheric phenomena was abandoned, and the fact of their extra-terrestrial origin was generally recognized. It is now perfectly certain that meteorites cannot have originated in volcanic eruptions on the earth or on the moon, as some have supposed, but that they came from remote parts of our solar system, or, more probably, from beyond its borders, or even from the region of the stars. That this is so is definitely proved from the velocities (many times observed), with which they encounter the earth. It is found that before the collision they must have been falling toward the sun along such elongated paths that upon reaching the earth's orbit their velocity of motion was very approximately 26 miles a second. This is the velocity which a body would acquire in falling to this distance from the sun from an infinitely great distance away, and leaves no room for doubt that each of these bodies was pursuing its own independent orbit about the sun before it suffered collision with the earth.

Many records of the fall of meteorites have been found in ancient annals, and in modern times, with so many observers continually watching the sky, the number of meteorites seen in flight is annually quite large, although the actual falls observed are always comparatively rare. The number entering the earth's atmosphere in a year has been estimated all the way from 70 up to 3,000 or 4,000. In 1879, on 10 May, there was a shower of meteoric stones in Iowa, the largest mass weighing more than 400 pounds. The last considerable fall in this country was recorded on 19 July 1912, when a remarkable detonating meteorite fell near Holbrook, Ariz. In this case the explosion so completely shattered the mass that the largest fragment found weighed but 14 pounds. Upward of 14,000 separate stones were gathered, their total weight being 481 pounds.

Perhaps the most famous meteorite of antiquity was the so-called stone of Egos-Potamos, which fell in Thrace in 466 B.C., and which was described as equaling two millstones in size. Plutarch speaks of it in his life of Lysander. In the Middle Ages the Stone of Eusisheim was very celebrated and became the object of superstitious reverence. It fell at Eusisheim in Alsace on 7 Nov. 1492, when the Emperor Maximilian was at that place. Fragments of this body were taken to Paris and London, but the principal mass, weighing more than 200 pounds, was suspended in the choir of the church of Eusisheim.

Almost every large meteorological museum contains specimens of meteoric stones and meteoric irons. There are some remarkable examples in the National Museum at Washington. An iron mass, supposed to be of meteoric iron, discovered at Cañon Diablo, Arizona, proved,

on examination a few years ago, to contain minute black crystals resembling the diamond, and a meteorite which fell in Russia contained similar black crystals of carbon.

It is yet a disputed question whether the huge masses of iron, weighing many tons, which were brought from Greenland to Stockholm by Baron Nordenskjöld, are really of meteoric origin. The same question attaches to a similar mass which Rear Admiral Peary transported from Greenland to New York. Other masses of this kind exist in various parts of the world. There is no record of their having fallen from the sky. A complete catalogue of all the meteorites of North America, together with a description of their falls, an analysis and a detailed description of the structure in each of them, and also a very complete bibliography was published in 1915 by O. C. Farrington. This work forms volume XIII of the 'Memoirs of the National Academy of Sciences' (Washington).

METEORITIC HYPOTHESIS, the theory of cosmogony profounded by Sir Norman Lockyer, to the effect that all astronomical systems, including the nebulæ themselves, and in particular those consisting of a central body and satellites result, not from the condensation of a nebula, but from the interferences and collisions of meteors more or less fortuitously grouped in space and with more or less fortuitous velocities. The structure of Saturn's rings and the behavior of the outermost planets seem to be susceptible of a better explanation on this theory than on the nebular hypothesis (q.v.), but certain difficulties have been met in connection with a peculiar line in the spectrum of the nebulæ, for the nebulæ, which according to the meteoritic hypothesis are formed from the substance of meteorites, contain an element, nebulium, found nowhere else in the universe.

METEOROLOGICAL SOCIETY, The Royal, a scientific body with headquarters in London. Its organization dates from 1850, and in 1866 it was incorporated. All theories and facts pertaining to meteorology are sought for in its records, the development of that science in all departments being the object of the association. Besides fellows, the Society consists of honorary members, this membership being bestowed upon distinguished persons of other than English nationality. The Society publishes the *Meteorological Record* and the *Quarterly Journal.*

METEOROLOGY, *μετέωρον*+*λεγειν*, literally the science of the things in the air. Meteorology has come to mean that part of natural philosophy that treats of the physics of the air and the mechanics of its motions. It includes climate (q.v.) and weather. The distinction in the meaning of the two terms is apparent when it is stated that one may well speak of the weather of to-day, or last month, or some past year, but not of the climate of a day, a month or a year, which is determined by finding the averages and the extremes of all the weather conditions for a long series of years: of the temperature, precipitation, humidity, sunshine, cloudiness and wind velocity and direction.

Theoretical Meteorology aims to trace out the workings of definite laws to explain the various atmospheric phenomena, and properly may include a study of variations in solar radiation, as effecting the earth's temperatures, or as the primary causation of terrestrial storms.

Applied Meteorology strives to apply the theory of meteorology to the art of weather forecasting, which, so far, has not passed beyond the empirical stage, and in various ways to utilize knowledge of the physics of the air in the commercial industries.

History.— The term science was not applicable to man's knowledge of the atmosphere at the time Virgil, Cicero and Aristotle wrote of the weather. As late as the time of the founding of the first of the 13 original colonies at Jamestown, Va., in 1607, practically nothing was known of the properties of the air or of methods for the measuring of its phenomena. The development of the thermometer and Torricelli's invention of the barometer in 1643 made study and investigation possible.

American scientists may well be proud of the services rendered by their countrymen to humanity in adding to our knowledge of the atmosphere. The act of the great Franklin in drawing down the lightning of the clouds and identifying it with the electricity of the laboratory was but one of his important contributions to meteorological science. In 1747, while taking observations at Philadelphia of a lunar eclipse, in co-operation with his brother at Boston, he learned that storms moving from the west, as all storms of the middle latitudes do, first begin with easterly winds, and as they approach a place of observation become westerly, and he came near discovering the cyclonic system of storms. Following the winter of 1783, famous in history for the phenomenal severity of its cold, and its long duration, Franklin, in a letter to a correspondent in Europe, called attention to the violent eruption of Mount Hecla the preceding year, and suggested that the dust therefrom may have been carried into the high strata of the atmosphere and spread around the earth by the winds. His idea was that this dust would screen off some of the sun's rays and add to the cold of winter. As in many other things, he had a prophetic vision, for there no longer is doubt that violent volcanic eruptions throw into the upper air large quantities of dust particles which, by swiftly moving easterly currents in the middle latitudes and westerly currents in the tropics, are so distributed around the earth as not only to effect the colors of the sky for two or three years after, but to modify the weather. Doubtless the earth in this year of 1919 still is feeling the cooling effects of the explosion of Katmai, in the Alaskan Peninsula, in 1912, augmented by volcanic explosions in Japan in 1913.

The author of the Declaration of Independence, Thomas Jefferson, took daily observations of the weather. He even carried his thermometer to Philadelphia and twice recorded the temperature of Independence Hall on 4 July 1776. He owned one of the only two barometers then in the colonies. In co-operation with James Madison (after bishop), who lived at Williamsburg, some 200 miles east of Monticello, he determined that changes in the barometer first begin several hours earlier at the westernmost station. The British ransacked his home and broke his barometer. It is said

that he berated them more for the destruction of his cherished instrument of the weather than he did for their burning of the National Capitol. As early as 1735 Hadley, an Englishman, had published an article explanatory of the trade winds, and Dalton, another Englishman, in 1793, made the first attempt to explain the phenomena of the atmosphere through the principles of philosophy. It was then believed that storms were straight-line gales. It remained for Redfield, an American, in 1831 to publish an epoch-making essay, in which storms were described as progressive whirlwinds, turning counter clockwise, with an easterly movement of translation for the whole system of spirally in-flowing air. Espy followed, in 1841, and showed that rainfall is caused by ascending currents, cooling by expansion as they rise until the water vapor becomes saturated. By the same line of reasoning he explained how descending air must heat by compression. In 1843 Tracy made an important contribution to the subject. Redfield had claimed that the air in storm-whirls neither moves in concentric curves nor along radical lines into the interior of the storm, but spirally inward. Tracy proved that Redfield was right, for he showed that the rotation of the earth must deflect all air currents to the right of the initial direction in the northern hemisphere, whether in storm-whirls or out of them. From 1840 to 1860 the other Americans who added most to our knowledge of meteorology were Maury, Coffin, Henry, Lapham and Loomis. Mathew Fontaine Maury, of the United States navy, was the pioneer in marine meteorology. He mapped the oceans and determined the direction and force of winds and water currents. In 1855 he published his 'Physical Geography of the Sea and its Meteorology.' See WEATHER BUREAU.

Source of the Atmosphere.— The larger planets of the solar system are believed by many scientists to have hot atmospheres still in violent agitation. According to the La Placian hypothesis of the origin of the earth, millions of years ago it also had a similar atmosphere. Much of the hot vapors which largely composed the earth's atmosphere during the early period of its existence, have been absorbed by its rocks or filtered away into space. The residual is supposed to constitute our present atmosphere. The moon shows no refraction or diffusion of light, such as would occur with an atmospheric envelope. It is dead. It died young because it is too small to have sufficient attraction of gravitation to long retain a life-sustaining atmosphere, or in fact, any atmosphere, the darting molecules of which have high velocities, and are captured by larger celestial bodies. Before the sun can have an atmosphere suitable for life an incomprehensible period will have elapsed, its light will have gone out, its heat will have ceased to reach the earth and the other planets in appreciable quantities, the earth will have been dead millions of years, and the sun itself will only receive heat and light from the feeble rays of the stars which, unlike itself, have not ceased to shine. Even though it have a suitable atmosphere, it must remain dead, for there is no external source whence it can receive appreciable heat.

Those who follow the Planetesimal hypothesis are required to believe that the earth's atmosphere has never been hot and has grown denser, rather than rarer, with the growth in size of the earth.

How Atmospheres are Lost.—Gases that cannot be held by the moon may be held by the earth and those that can escape from the earth may be held by the larger planets. An understanding of how gases are lost through the kinetic energy of molecules requires that careful account be taken of the relations that exist between the attraction of gravitation of planets, their temperatures, and the weight of the molecules of the different gases that compose their atmospheres. The speed of the molecule depends on its temperature and its mass, being less at low temperatures and greater at high temperatures, and light molecules moving more swiftly than heavy ones. A gas is composed of molecules that dart about at velocities which, in connection with numerous collisions (seven or eight millions for each molecule near the earth in $\frac{1}{10^{10}}$ of a second) and the energy of each molecule, may allow a certain proportion of them at any one time, to reach velocities so great that, if they pass into the outer layers of the air, where collisions are infrequent, they escape from the attraction of the planet and pass away never to return. According to the kinetic theory it would appear that the earth's gravitation and the temperature of its outer air are such as to retain without appreciable loss argon, carbon dioxide, oxygen, nitrogen, vapor of water, and ammonia, but that helium and hydrogen, because of their lesser specific gravity, escape from the top of the atmosphere about as fast as they are supplied from hot springs and other sources at the bottom.

Proportion of Gases Aloft.—Samples of air taken at various elevations up to nine miles show the atmosphere to be a homogeneous mixture, with the proportions the same at all elevations; but this is what one would expect from the mixing of the air by the ascending and descending whirls of cyclonic storms. Storms operate only in the lower air and all ascending and descending currents practically cease below the 10-mile level. Above this altitude it reasonably may be assumed that the heavier gases steadily lose in proportion to the lighter ones until at about 60 miles nothing but hydrogen and helium remain.

Atmospheric Air.— The earth is surrounded by four important atmospheres — nitrogen, oxygen, vapor of water and carbon dioxide — and others of less importance, each comporting itself, in accordance with Dalton's law, practically as it would do if the others were not present, except that its rate of diffusion is retarded by their presence. This composition is atmospheric air — usually called air. Both by volume and by mass oxygen and nitrogen are the principal atmospheres. They, like the others, are in mechanical mixture and not in chemical combination. Because of their relatively greater importance separate articles are devoted to nitrogen and oxygen (qq.v.). But it should not be thought that because some of the other constituent gases are relatively small in amount they are not vitally important in carrying on of the functions that nature seems to have assigned to the air.

As well as germs, dust and cloud particles, air, over land, contains sulphates in minute quantities, and over the sea and near the sea-

shore salt left from the evaporated spray can always be detected.

Carbon Dioxide.— In cities the amount of carbon dioxide is considerably greater than in the country, frequently rising to 0.07 per cent by volume, and even to 0.10 per cent when there is but little wind to scatter what accumulates near the ground. In crowded theatres Angus Smith found as much as 0.32 per cent and in mines 2.5 per cent. The latter amount would soon be destructive to animal life. This gas is 1.50 times as dense as an equal volume of air. Its density causes it to collect in mines, sewers, cellars and other low and confined places, unless there is forced ventilation. The sweep of the American cold wave, with its heavy air moving at a high velocity, is highly beneficial. It searches into cracks, crevices and into enclosures that are not hermetically sealed and expels the foul air. All nature feels the revivifying effects of rain and high wind; one washes out the carbonic-acid gas (carbon dioxide) from the air, with the dust and other particles in suspension; the other enters our habitations and drives out the poisonous atmospheric accumulations. It cannot be too strongly impressed upon the reader's mind that oxygen, the life-sustaining principle of the air, decreases, and carbon dioxide, a poison, increases in air that is breathed, or in air in which candles, oil-lamps or gas are burning; and that all places of habitation, especially those that are used for sleeping-rooms, should have a continuous supply of fresh air.

Water vapor is another of the four important atmospheres. It may vary in amount from a fraction of 1 per cent for the arid regions to 5 per cent of the weight of the air for the warm humid regions. It is a little over one-half as dense as atmospheric air. When the air has taken up all the water vapor that it can contain at a given temperature it is said to be *saturated.* Saturation seldom occurs in free air, except inside of a dense fog or cloud, or within the thin stratum of air that by contact with a cold surface has had its temperature lowered to the point of condensation. Even during heavy downpours of rain the air near the earth is usually capable of evaporating some of the rain that is falling through it. In fact light precipitation may be entirely taken up by the lower air and never reach the earth. The *dew point* is the temperature of saturation. The *relative humidity* is expressed in percentages of the amount necessary to saturate. At a temperature of 32° F., air resting over a moist surface may continue to increase the amount of its vapor of water until it contains 2.11 grains per cubic foot, which amount is sufficient to exert a pressure in all directions equal to the downward pressure of 0.18 inch of mercury; it will then be saturated and its relative humidity be 100 per cent. The point to which attention is especially directed is that the pressure of 0.18 inch indicates the maximum pressure of water vapor at 32° temperature, and any further evaporation must be accompanied by an equal amount of precipitation. Now, if this air be suddenly raised in temperature to 51° its capacity per cubic foot will be increased to twice what it was at 32°, the 2.11 grains will only be equal to one-half the number necessary to saturate and the relative humidity be expressed by 50 per cent instead of 100 per cent. *The absolute humidity* is expressed in grains per cubic foot, or by the pressure in inches of mercury. The *hygrometer* measures the amount of water vapor.

Ozone has powerful bleaching and disinfecting properties. By reason of the unstable condition of the molecular structure it is a much more active oxidizing agent than oxygen and this fact in part accounts for the less amount observed in the air near the ground and for the almost total absence of ozone from the air over large cities, where decaying organic matter exists at all times in comparatively large quantities, the ozone rapidly entering into chemical union with whatever is in the process of decay. Ozone in the minute quantities found in nature is healthful, but the quantity is not large that will cause the death of an animal confined in the air containing it. It may be that the invigorating effects of the crisp air of a frosty morning, and of the dry air of the cold waves of winter, are due, in part at least, to the ozone and electricity in the air; and may not the healthfulness of mountain air be due to the increase with elevation of the quantity of ozone and electricity, as well as to the less quantity of dust and disease germs? Sea air also is rich in ozone and deficient in dust and noxious germs. The maximum daily amount greets the early riser, for ozone is present in greatest quantity between 4 and 9 A.M., and in winter the amount is greater than in summer.

Dust in the Air.— Dust rains into the atmosphere from outer space, and meteors that are consumed through the heat generated by striking into our air contribute to the supply. Other sources are volcanoes, combustion, salts from the spray of the ocean and small particles of matter lifted up by the winds.

A recent research by Humphrey shows that each of the important volcanic eruptions since 1750 have effected a cooling of the earth's temperatures through the action of dust shot into the upper air and wafted about the earth. It is shown that the ratio subsisting between the size of the dust motes and the wave lengths of solar and terrestrial radiations is such as to reflect back into space more of in-coming heat than there is intercepted out-going heat from the earth. Each important eruption has affected the temperature of the earth and the color of the sky for from one to three years.

Heat of Interstellar Space.—Although the ether transmits through all space the various forms of solar energy, none of this energy becomes thermal until it is intercepted by the atmosphere of our earth or by the gaseous envelope of some other planet, or by the body of some meteor or comet or by cosmic dust. Objects or planets without atmospheres like our moon are, therefore, nearly devoid of temperature, approaching absolute zero, which theoretically, is — 450° F.

Earth's Heat.— It is believed that the interior of the earth still retains an intensely hot temperature, and that this hot mass is surrounded by a cool crust that is a poor conductor; so that only a small amount escapes into the atmosphere. The innumerable stars, though their average temperature probably is equal to that of our sun, are too distant to have an appreciable effect in heating the exterior of the earth. It is apparent, therefore,

that the sun, with an absolute temperature over 20 times as high as the absolute temperature of the earth, controls the surface temperature of our planet and its atmosphere.

Sun's Heat Variable.—The number of gram-calories received per minute on a square centimeter of normal surface outside the earth's atmosphere is called the *solar constant.* In Abbot's refined measurements at Mount Whitney he obtained values of the solar constant varying from 1.93 to 2.14, the mean for the first two years being 2.022.

Variable Quantity of Heat Received Each Day.— The quantity of heat that falls upon a horizontal area at the top of the earth's atmosphere during any consecutive 24 hours depends upon four conditions: (1) The altitude that the sun attains when it crosses the meridian at noon, (2) the length of the day time, (3) the distance of the earth from the sun, and (4) constancy of solar radiation; these are in a perpetual state of variation, except that near the equator the day and the night are always equal.

Quantity of Solar Rays Absorbed by the Atmosphere.— On the average the atmosphere of the earth absorbs about 76 per cent of the total incident solar energy. About one-half is absorbed by a cloudless atmosphere, and nearly all absorbed or reflected away by a cloudy air. On the average 52 per cent of the earth's surface is obscured by clouds all the time which, according to Abbot, reduces the total amount of insolation that reaches the earth to but 24 per cent.

Terrestrial Radiation.— When solar radiation is absorbed either by the gases of the air or by dust in suspension in it, or by the earth itself, the energy of the ether is transmuted into molecular vibrations of the matter that absorbed it. The temperature of the matter is raised and it itself sends out radiations in the form of heat-waves, which readily escape through the atmosphere unless intercepted in their passage by cloud or water vapor. There is no permanent increase in the temperature of the earth or atmosphere, therefore there must be a continual loss of heat in some way, and this is brought about by the outward radiation of earth and air toward interplanetary space. During the spring and summer the gain of heat by the atmosphere is greater than the loss; during the autumn and winter these conditions are reversed.

Why Mountain Peaks are Cold.— The absorption of solar and of terrestrial radiation by the air is greater in its lower levels, where dust, water vapor and clouds are densest, while the transmission of both incoming and outgoing radiation is more rapid through the pure air aloft. Thus we account for the coolness of all mountain peaks.

Nocturnal Cooling of Earth and Air.— Terrestrial radiation goes on day and night, winter and summer. During daylight the gain of heat is greater than the loss, while at night the reverse is true. After the sun has passed below the horizon both the earth and the air continue to cool by radiation, unretarded by the counteracting effect of insolation. The earth loses heat, even under a clear sky, more freely than the air, with the result that the surface of the ground and of vegetation and the air in close proximity thereto may sink to a temperature 10° or 15° lower than that of the air at considerable elevations. This condition is called *temperature reversion.* It occurs both winter and summer. The greater difference will occur when there is but little wind to mix the air. On a clear night in summer there may occur an increase in temperature up to a height of 200 to 600 feet, and then a steady fall, reaching the surface temperature at about 2,000 feet elevation, unless radiation be diminished by saturation of the soil or the location be adjacent to a considerable body of water.

Unequal Heating of Land and Water.— The thermal effect of a given quantity of heat falling upon various forms of matter differs with the substance; this is notably apparent when the matter is land, water or air. The same amount of heat will raise the temperature of a water surface only about one-fourth as much as it will raise the temperature of a land surface. Water rejects by reflection a considerable amount of the solar radiation that reaches it, while land reflects but a small part, and of that which falls upon the top layer of water much is expended in the process of evaporation and does not impart warmth to the water. Solar radiation also penetrates water to a considerable depth and is quite uniformly absorbed by the whole stratum penetrated. These conditions give to large water surfaces and the air immediately over them a much lower temperature during the day and a much higher temperature during the night, and also lower temperatures during summe. and higher temperatures during winter, than occur over a land surface of the same latitude and approximate elevation.

Ocean Temperatures.— Because of the displacement of oceanic isothermals by ocean currents it is impossible to name a definite temperature as prevailing over oceans at all places on a given parallel of latitude. But in a general way it may be stated that at the equator there is a surface temperature of 82° to 84° F., which changes less than a degree between day and night, and not over 5° between winter and summer; at a depth of 400 fathoms the temperature is 44° and unchangeable, and below 1,000 fathoms it is but little above the freezing point of fresh water — namely, 34° to 36°. At latitude 70° north the temperature has but little diurnal variation, and a yearly range of from 35° in winter to 45° for summer; at a depth of 400 fathoms it remains steady at 32°. From this level there is a gradual decrease to a depth of 1,000 fathoms, where a constant temperature of 28° exists, and below this to the bottom there is no change.

Vertical Decrease of Temperature.— From the Paris records the mean fall in temperature per 1,000 feet up to a height of 20,000 feet is 2.4 in winter, 2.8 in spring, 2.6 in summer, 2.5 in autumn and 2.6 for the year. From the Berlin records it is 3.1 winter and spring and 3.0 in summer and autumn. It should be noted that the decrease is greater at Berlin, which is farther from the influence of the ocean than is Paris. In the interior of the United States it is still greater.

Isothermal Layer.— During the past 15 years the atmosphere has been explored to altitudes of from 15 to 30 kilometers by the sending up of sounding balloons equipped with suitable instruments. We find that there are two distinct strata in our atmosphere that inter-

mingle but slightly: a lower turbulent one, in which all of the ascending and the descending whirls that constitute storms and cold waves operate, and in which the temperature decreases rapidly with elevation; and an upper or outer one, in which there is such small change of temperature with elevation, so far as observations have reached, that it is called the *isothermal layer*. The lower stratum is about 12 kilometers in depth; the upper one extends to limits unknown. The average temperature for summer at the top of the storm stratum is — 52° C., and 8 kilometers higher in the isothermal stratum, — 51°. In winter the temperatures at these two places are — 58° and — 57° C. Note that the temperature slightly increases with elevation in the region above storms; although we feel justified in assuming that farther out the temperature must lose with altitude until at the outer limits of the atmosphere it approaches absolute zero. The greatest altitudes reached showed about one-half the difference in the temperature between winter and summer that is found at the earth's surface.

Diurnal Range of Temperature.— The average difference between the temperatures of day and those of night diminishes with ascent in the free air until at only a few thousand feet from the surface of the earth (3,000 to 5,000) there is no difference between the heat of midday and that of midnight. The diurnal range of temperature is greatest at the equator and diminishes irregularly with latitude, being greater over land than over water on the same parallel.

Annual Range of Temperature.— The annual range of temperature increases with latitude, being the greatest for the interior of continents and least for islands and near the oceans. It decreases with gain in elevation in free air, being about 7° C. at 18 kilometers about the earth.

Frosts.— As previously explained, a given quantity of heat being absorbed by different substances of unequal specific heats will produce a different temperature in each; the lower the specific heat of a substance the higher will be its temperature; and besides different substances have different coefficients of absorption and reflection. Therefore ,under the same insolation rocks, clay, vegetation and other substances come to temperatures that differ by many degrees. The air next to earth largely partakes of the temperature of the surface, and in consequence when the sky is clear so that incoming and outgoing radiations may progress freely and the air is little disturbed by wind, wide variations in the temperature of a thin stratum of lower air may occur over adjacent plots of ground of precisely the same elevation, but different covering, and frost form. Difference in elevation may also cause marked differences in minimum air temperatures where the surface covering is uniform and frosts of varying degrees of intensity occur. During clear, cool nights with light winds, frosts will occur in bogs or on low, damp ground, while in the surrounding uplands the temperature may be 10° to 20° higher.

Atmospheric Pressure.— The attraction of gravity on the gases of the atmosphere causes them to exert a pressure on the surface of the earth. The average pressure at sea-level is about 14.7 pounds per square inch. If we remove the air from the inside of a vessel by means of the air pump or otherwise, then the external pressure becomes at once apparent. This pressure is in all directions, upward as well as downward; it is measured by the mercurial barometer. See BAROMETER.

To get the true pressure of the air it is necessary to apply corrections for temperature (32° F. is the standard), gravity, which varies with latitude, and instrumental error; and when barometer readings from several stations are to be compared it is required to reduce them to what they would be if the stations all had a common level. Usually they are reduced to sea-level by adding to each the inches of mercury equivalent in weight to the column of air between the barometer cistern and sea-level. This is the pressure usually entered on weather charts.

Isobars.— In order to present graphically the distribution of atmospheric pressure over the earth's surface it is customary to draw lines through points having the same sea-level pressure. These lines are called isobars.

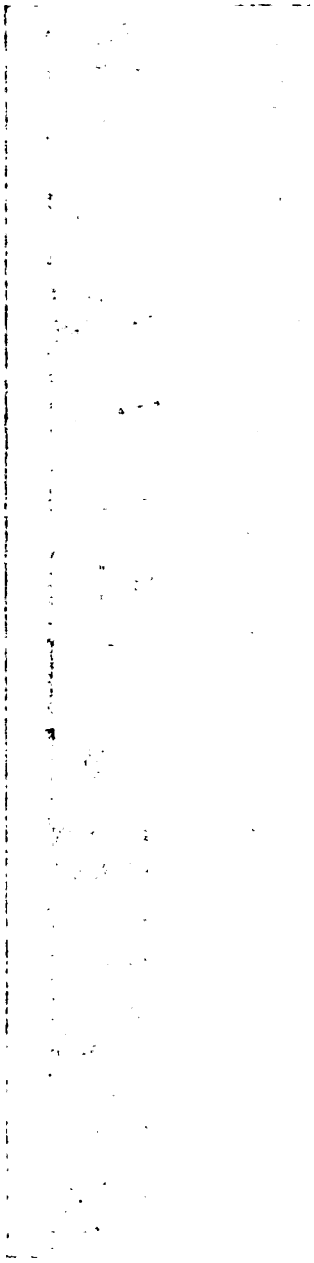
Barometric Gradient.— The distance between isobars shows the steepness of the barometric gradient. The unit of horizontal distance usually employed is the distance of 1° on a meridian. Thus, if the difference in pressure between two points is one inch and the distance between them is equal to the length of 10° on a meridian the barometric gradient is 0.1 of an inch.

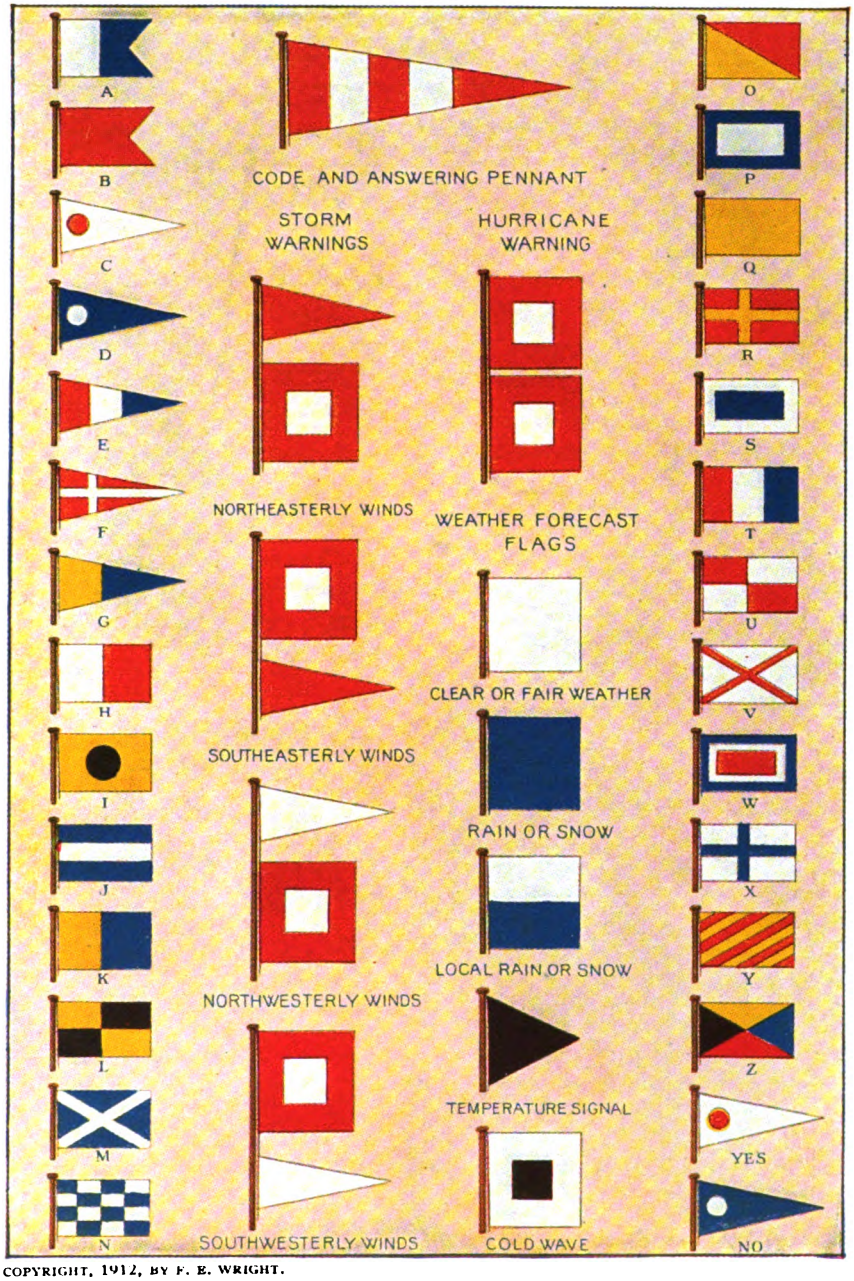
Distribution of Pressure.— The average of all the pressures of the year show belts of high pressure at about latitude 35° north and south, and a belt of low pressure at the equator, all of which move north and south appreciably with the annual march of the sun.

W. J. Humphreys computes the vertical temperature gradient to be as follows:

Height		Pressure	
Kilometers	Miles	Millimeters	Inches
0	0	760	29.92
11	6	168	6.61
20	12.4	39.6	1.56
30	18.6	8.04	0.33
40	24.9	1.65	0.065
50	31.1	0.466	0.018
100	61.1	0.0076	0.0003
150	93.2	0.0043	0.00017

There is a close relation between temperature and pressure. If one takes the average pressures for all the warm months and those of all the cold months it will be found that continents have low pressures in summer and high pressures in winter, and that the intensity of the lows and of the highs will bear a definite relation to the size of the continental area and its distance from the equator. These conditions are reversed on the oceans, the lows occurring in winter and the highs in summer. The heat of summer raises the land to a higher temperature than it does the water. The air expands, rises and overflows to the oceans, leaving a deficient pressure on the continents and an excess on the seas. In winter the land loses heat much more rapidly by radiation





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INTERNATIONAL CODE AND U. S. WEATHER BUREAU SIGNALS

than does the water. It contracts, and in the higher levels flows back from the water.

The average hourly pressure for a considerable period will show the barometer rises from 4 A.M. to 10 A.M.; then falls to 4 P.M., and rises to a second daily maximum at 10 P.M.; when it slowly falls to a secondary minimum at 4 A.M. These variations are greatest at the equator, diminishing with latitude until they are hardly distinguishable at the poles.

General Circulation.— In the tropics the winds blow almost continuously from the northeast in the northern hemisphere and from the southeast in the southern hemisphere, with irregular winds, mostly from the west in extra-tropical regions. The explanation of the trade winds is that the heat of the sun raises the temperature and expands the air most where its rays fall nearly perpendicularly. This causes the air to ascend in the region of the equator and to flow in along the surface from either side. Since, however, air moving from higher to lower latitudes passes successively over parallels having greater easterly motion than its own, or rather greater than the parallel whence it started, it would, on account of its momentum, fall behind the diurnal motion of the earth and be deflected more and more to the west. Over the warmest belt it would rise. In rising it would cool by expansion, so that in flowing away from the equator, as it must do to make room for the air continually flowing in at the surface, its tendency would be to gradually fall, reaching the surface in temperate latitudes and contributing to create the belt of high pressure existing at latitude 35° each side of the equator.

The air aloft in going from low to high latitudes passes successively over parallels of latitude having less and less easterly motion, so that it runs ahead of the diurnal rotation of the earth or is deflected more and more to the east, giving us the prevailing westerly winds of the temperate zones when this air comes to earth.

From the isothermal level downward to the surface, between latitudes 30° and the poles, there are cyclonic circulations, central at the poles. The centrifugal force of these winds, because they run ahead of the earth, is greater than it would be if they ran with it, and consequently the air of high latitudes, as it encircles the globe, tends to pile up over latitudes farther south.

Local Circulation.—As previously indicated, the permanent circulations are due to equatorial heating and polar cooling and to the great subpermanent high pressure and low pressure systems created by the different heating effects of continents and oceans. Recently these systems have been called Great Centres of Action. They are built up and disintegrated and change their geographical positions slowly. While they do not have a velocity of translation, like the ordinary cyclones and anti-cyclones that move across continents and oceans and cause the changes of weather that occur from day to day, they do profoundly influence the intensity of storms and the path along which they may move. They, therefore, determine, in a general way, whether the character of the weather for weeks at a time shall be wetter or drier, colder or warmer, than the seasonal average.

Cyclones.— The cyclone, or low pressure, is a system of spirally inflowing winds which ascend in the region of the centre, cool by expansion with gain in altitude and usually cause precipitation in the form of rain or snow. At or below the heights of the wispy cirrus clouds the air flows outward, and at some more or less remote place moves downward in the form of an anti-cyclone. Storms move eastward in the middle latitudes and westward in the tropics, and rotate counter-clockwise in the northern hemisphere and in the opposite direction in the southern hemisphere. While the velocity of gyration may be anywhere from zero to 100 miles per hour, depending upon the steepness of the barometric gradient toward the centre, the velocity of translation of the whole whirling mass usually varies from 20 miles per hour in summer to 40 miles in winter.

Anti-cyclone.— In the anti-cyclone all the movements of the cyclone are reversed except the direction of translation. The air flows downward near the centre and spirally outward along the surface of the earth. It usually is accompanied by clear, cool and settled weather, and this notwithstanding the fact that the air heats by compression as it descends, which apparent inconsistency will be explained in the paragraph on Cold Waves.

Origin of Storms.—Any flowing together of the air between two anti-cyclones must produce a cyclone, and it has been shown that the unequal heating effects of land and water surfaces may be sufficient to initiate cyclonic and anti-cyclonic action.

A hypothesis to account for the beginning of storms that is attracting the attention of meteorologists, assumes that the earth, at times, passes through shafts of extra solar heat, which expand the air at the equator more than they do at higher latitudes, causing the atmosphere at the equator to bulge up until masses at high levels gravitate toward the poles. These masses cool by expansion and by radiation, gain in specific gravity and sink to the earth in the middle latitudes or the north part of the temperate zone. As they come down they rotate in an anti-cyclonic manner and constitute cold waves. Each descending mass forces the ascent of cyclonic whirls or storms on either side. The storms thus formed may move eastward for great distances, crossing continents and oceans before being disintegrated. According to theory these extra heat shafts from the sun may persist for months and return to affect our weather with each 25-day rotation of the luminary. An allowance of 18 days is made for the air to perform the overhead circulation from the equator after each heat impulse before the cold wave appears on our western border. According to this hypothesis these cold masses should settle over land in winter and over oceans in summer, which agrees with observed fact.

Abbot's researches have shown much of the varied character of solar radiation. With a continuation of his work and of that of Kimball, of the Weather Bureau, whose investigations were begun and continued for many years under the direction of the author, the time may come when the general character of seasons may be foretold.

Temperatures of Cyclones and Anti-cyclones.— According to Ferrel and other early

students temperature is supposed to be arranged systematically about the centres of cyclones and anti-cyclones. We now know that such is not the case, that the cyclone as a whole is not a warm area, nor is the anti-cyclone a cold area, but that the rising temperature occurs on the western side of the high area and on the eastern side of the low area, and that the falling temperature is on the western side of the low area and on the eastern side of the high area.

Hurricanes.—The hurricane of the West Indies is the same as the *typhoon* of the Philippines and the China coast. The ordinary cyclonic storm that crosses the United States is about 1,000 miles in diameter. The hurricane is a cyclone usually of only about 100 to 300 miles in diameter, but with a gyratory velocity far in excess of the storms of the temperate latitudes. It occurs in the tropics, moves westward and northward at the rate of only 7 to 12 miles per hour, while the air inside of the storm may be whirling at the rate of over 100 miles. At latitude 26° its path recurves in the form of a parabola, and the storm passes to the northeast. They occur mainly in the four months July to October.

Tornadoes.— The tornado also is cyclonic in its movements, but instead of being 1,000 miles in diameter like the continental cyclone, or 100 miles like the tropical hurricane, it usually has a diameter of gyration of only about 100 to 300 yards, and its speed of rotation is so terrific that no instruments have ever held together long enough to measure its velocity, which must equal or exceed that of a rifle bullet, as the writer has seen wheat straws that were shot by the wind of a tornado one-half inch into the tough body of an oak tree, and a two by four pine scantling driven through five-eighths of an inch of solid iron. As a rule they occur in the spring of the year, in the southeast quadrant of a cyclone, when the temperature and humidity are high. Their direction nearly always is toward the northeast. They occur with the greatest frequency in the States bordering on the Mississippi River.

Thunderstorms.— The thunder storm turns about a horizontal axis instead of a vertical one, as in the case of the tornado. On land thunderstorms occur most frequently at specified hours of the day or night, such as 3 to 5 in the afternoon or 9 to 10 in the evening, and sometimes even at 2 or 3 in the morning, but no such periods are observed over the ocean. They occur at any hour of the day or night with equal frequency. In regard to the electrical phenomena of the atmosphere it is not safe to hazard definite statements, but possibly auroras are due to earth-captured solar electrons, while the lightning of a thunderstorm owes its origin, chiefly at least, to the electrical separation produced by the action of wind on raindrops.

Cold Waves.— The area and intensity of cold waves depends upon the size of the continents and their distance from the equator. The interiors of North America and of Siberia experience more severe cold than occurs at either pole. Departures from the normal temperature of a time and place are due to the dynamic heating and cooling of the air through its upward and downward motions below the six or seven-mile level. Air heats by compression at the rate of about 1° for each 3[illegible] feet of descent in the anti-cyclone, but this heating induces clearness through the evaporation of clouds and allows a rapid loss of heat by radiation. And then the temperature of the air before it starts on its downward journey is so low that notwithstanding the heat of compression, it may be extremely cold when it reaches the earth. However, it is difficult to formulate any hypothesis that will fully account for the cold of the east side of the anti-cyclone being so much greater than that of the west side, or for the heat of the east side of the cyclone being so in excess of that of the west side.

Warm Waves.— In summer there come periods of stagnation in the drift of the highs and the lows. At such times if a high sluggishly rests over the south Atlantic Ocean between Bermuda and the coast of the United States and a low over the northern Rocky Mountain region, there will result what is popularly known as a warm wave, for the air will slowly and steadily flow from the southeast, where the pressure is greater, toward the northwest, where the pressure is less, and, receiving constant accretions of heat from the hot, radiating surface of the earth, finally become abnormally heated. This superheated condition continues until the high over the ocean dies out or drifts away. Consult Davis, 'Elementary Meteorology' (Boston 1894); Ferrel, William, 'Treatise on the Winds' (New York 1893); Flammarion, 'Thunder and Lightning' (Boston 1906); Hann, 'Lehrbuch der Meteorologie' (3d ed., Leipzig 1914); Milham, 'Meteorology' (New York 1912); Moore, 'Descriptive Meteorology' (ib., 1910); Waldo, 'Practical Exercises in Elementary Meteorology' (Boston 1899).

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METEOROLOGY, Marine, differs from that of land areas chiefly from the fact that the rays of the sun penetrate more deeply into the ocean substance than into the land and that the diffusion of this heat through the water body is practically uniform. The ocean thus becomes a vast storage reservoir of heat which is but slowly returned to the atmosphere. The effect upon the ocean climate is to render it more equable. An example of this is seen in the climate of the British Isles, Ireland particularly, where the prevalent west winds coming from the great ocean area temper the climate to a remarkable degree. It is a fact notable in this connection that in the approach of winter in the northern hemisphere, when the frost line of the land areas has reached as far south as the parallel of 38° N., on the ocean areas it is not at 65° N. Ocean storms are generally more severe than land storms, but exhibit a close approximation to theoretical form and their progress can be much more accurately foretold. Consult McAdie, A. G., 'Principles of Aerography' (Chicago 1917); Moore, Sir J. W., 'Meterology Practical and Applied' (London 1910).

METEORS. See SHOOTING STARS.

METH. See MEAD.

METHANE, CH_4, also known in the impure state as Marsh Gas, or Firedamp, is found in large quantities in the gases evolved from petroleum wells, oil springs and mud volcanoes. It is present in stagnant pools (hence the name marsh gas) and in certain localities where organic matter is allowed to decay in a limited supply of air. The firedamp of coal mines is methane mixed with a small percentage of carbon dioxide, nitrogen and oxygen. Enormous quantities of methane are present in the burning gases that constitute the "Holy Fire" at Baku in the neighborhood of the Caspian Sea. Methane is formed in the fermentation of compounds like cellulose, milk sugar or calcium butyrate, in the thermal decomposition of alcohol, ethane, ethylene or acetylene and in the dry distillation of vegetable matter. Illuminating gas, produced by the destructive distillation of coal, may contain as much as 40 per cent of methane by volume.

The compound may be prepared in a fairly pure state, (1) by treating commercial aluminum carbide with water; (2) by the interaction of hydrogen and an oxide of carbon at 250° C., in the presence of finely-divided catalyzers like cobalt, nickel or iron; (3) by heating a mixture of fused sodium acetate and dry soda-lime; (4) by the interaction of carbon bisulphide, metallic copper and hydrogen sulphide at an elevated temperature; (5) by maintaining charcoal from sugar in a stream of pure, dry hydrogen at 1.150° C. Chemically pure methane has been prepared by the reduction of methyl iodide. In this process the iodine is mixed with equal volume of alcohol and treated with the "zinc-copper" couple.

Methane is a colorless inodorous gas with a density $=0.559$ (air $=1$). It burns with a faintly luminous flame and with the evolution of much heat. Mixed with air or oxygen in certain proportions and then ignited it explodes violently, one volume of methane forming with 9.5 volumes of air an extremely explosive mixture. On account of its low boiling point methane was for a long time known as one of the permanent gases. It was liquefied by Cailletet in 1877. The liquid is colorless, boils at — 164° C. and solidifies at — 185.5° C. when the pressure is diminished to 80 millimeters.

Methane is a saturated compound and is extremely stable. Reagents like fuming nitric acid, strong sulphuric acid or phosphoric anhydride have practically no action upon it even at elevated temperatures. In the presence of chlorine, bromine or fluorine, methane undergoes a chemical change by substitution, i.e., by the replacement of one or more hydrogen atoms by equivalent atoms of the halogen. Long contact with chlorine, for example, even in diffused daylight and at ordinary temperatures, will convert methane into CH_3Cl (methyl chloride), CH_2Cl_2 (methylene chloride), $CHCl_3$ (chloroform) and CCl_4 (carbon tetrachloride), a molecule of hydrochloric acid being evolved with the introduction of each atom of halogen. At temperatures not lower than 1.300° C. methane has been completely decomposed into carbon and hydrogen. With a mixture of nitrogen and hydrogen in the electric arc it has been successfully converted into hydrocyanic acid. Patents have also been taken for the oxidation of methane (under the catalytic action of tan bark) into formic acid, methyl alcohol and formaldehyde. See GASES IN MINES AND COAL.

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METHODIST BOOK CONCERN. See METHODIST EPISCOPAL CHURCH.

METHODIST CHURCH (SOUTH). See METHODIST CHURCHES OF THE WORLD.

METHODIST CHURCH UNION. The Methodist Episcopal Church was divided in 1844 by the subject of slavery. This led to the formation of the Methodist Episcopal Church, South. Beginning with a conference at Cape May, in 1876, several attempts have been made looking toward union. The General Conference of the Methodist Episcopal Church, South, appointed a commission in 1914. The next General Conference of the Methodist Episcopal Church which met at Saratoga, N. Y., in 1916, also appointed a commission. The commissions have held several meetings together but have not yet arrived at conclusions. The bond between the two denominations is very close. They have already united in some of their mission work, especially in education and publication. Many leaders of the Methodist Protestant Church look forward to the time when their body will also be included in the union. The combined membership would be in excess of 6,000,000. In the meantime the three largest groups of Colored Methodists including the African Methodist Episcopal Church, the African Methodist Episcopal Zion Church and the Colored Methodist Episcopal Church, have taken the preliminary steps looking toward union in 1924. They hope that the negro members of the Methodist Episcopal Church will unite with them. The total combined membership of the four groups would be more than 3,000,000.

METHODIST CHURCHES OF THE WORLD. A group of 25 organized bodies which represent an evangelical type of the Christian religion, and which, rising under the Wesleys in England, in the 18th century, has been spread to all countries and has become one of the great Christian Communions.

History of English Methodism.— The rise of Methodism was on this wise. John and Charles Wesley, clergymen of the Church of England, as their father was before them, formed, 1729, at Oxford University, with others, a club for the promotion of personal religion. Being very earnest young men, they proceeded to draw a series of rules of conduct, which were somewhat strict for the times, and observed so carefully that they were called in derision, "Methodists," and their little company was termed the "Holy Club." They prayed much, read devotional books and visited the sick and unfortunate. The age was one of laxness in religious observance and of indulgence in gambling, drinking and other vices and immoralities, which invaded church circles. This tended to deepen the earnestness and enthusiasm of the young reformers and a revival was the natural outcome, the sweep and influence of which no one of them could have imagined. Three men of remarkable power were at the head of the movement, John Wesley (born in 1703), preacher, leader, organizer, author, indefatigable worker; Charles Wesley

(born in 1707), pupit orator, unequaled hymn writer; George Whitefield (born in 1714), evangelist, whose fiery zeal and persuasive eloquence won tens of thousands on both sides of the ocean. All of them great preachers, John was pre-eminently the organizer. His religious experience passed through several stages, the last of which was in 1738, when at a Moravian meeting in London, he "felt his heart strangely warmed." The next year he began to organize converts into societies, which was the actual epoch of Methodism. Opposition in the Church of England, which closed its churches to him, compelled him to resort to open-air preaching which multiplied his hearers and made the movement a people's movement. The preaching was clear, direct, simple, setting forth the doctrine of a free, full, present salvation from sin by faith, and presenting religion of the heart rather than of the head. The Wesleys never severed their relation with the Church of England, nor abandoned its doctrinal and ecclesiastical systems. Methodism in England was a movement within the Church, to which the societies looked for the sacraments until after the death of the founder.

The Methodist system was a gradual development out of the conditions which forced Wesley to take steps contrary to his High Church ideas. Consecrated places being shut to Methodist meetings, he had to build chapels and hold services in schools, private houses and barns, and in the open air; ministers being too few to do the preaching, he called to his aid laymen; societies increased so rapidly that it was necessary to plan for their care, hence the annual conference; changes in appointments being necessary, the itinerancy was developed to regulate them. Other distinctive features of Methodism, the class meeting for testimony and prayer; bookrooms for the publishing and sale of a growing body of denominational literature, and the conference study for the training of preachers not college bred, were likewise in answer to the demand of a rapidly expanding propaganda.

British Methodism did not, after the death of John Wesley, escape the fate of division. Indeed, radical doctrinal differences developed between him and Whitefield, and a separation took place, the latter being a pronounced Calvinist and the former a strong Arminian. One cause or another brought a number of separations, with 9 or 10 different branches. By the process of union several of these have disappeared and there are now five distinct bodies, not including the Welsh Calvinistic Methodist Church which affiliates with the Presbyterian churches.

1. Wesleyan Methodist Church.— John Wesley dominated in absolute fashion the organization he had created, until the success of the American Revolution compelled recognition of the independence of the societies in the United States and in England, as long as he lived. He held both property and patronage; but in anticipation of his death (1791), he prepared a "Deed of Declaration" which constituted 100 preachers, selected by himself, a Legal Conference to hold the Church property and provide for the annual appointment of the preachers. Thus was distributed the large powers which he had held in his own hands and which he was apparently unwilling to entrust to any individual as his successor.

The first Wesleyan Methodist Conference was held in 1744, when Wesley counseled with his preachers and a few clergymen who favored his work, and rules were adopted for the benefit of the societies and the preachers. Later on separate conferences were held in Ireland, which Wesley had first visited in 1747, and in America, in 1773, whither two preachers had been sent in 1769. In 1770 there were upward of 29,000 members and probationers in the British societies, and at the time of Wesley's death 71,568. This success had not been obtained without a great deal of hard labor, in which Wesley himself was the chief, continually traveling, preaching at all hours of the day and night, and enduring besides the natural discomforts of his journeys and exposures, obloquy, abuse and even mob and individual violence.

After his death the Conference was at odds on the question of the administration of the sacraments. At its session in 1792, it prohibited them, removing the prohibition in 1793 and subsequently providing for them, and later still for the ordination of ministers. In the 19th century, Home and Foreign Missionary societies were formed and other denominational enterprises instituted. There are two colleges, Wesley, at Sheffield, and Queen's, at Taunton, and a theological college in four places. Lay members were admitted to the Conference in 1878. Beside the annual Conference in England there are conferences in Ireland, France and South Africa. The Church has in Great Britain (1917) nearly 492,000 members and probationers, and in other conferences and its foreign missions, 361,398; in all, 853,398. Methodism is intensely missionary in its spirit, by which it has been carried to the ends of the earth. Wesley's first missionaries were sent to the American colonies and next to the West Indies. The Missions in Africa and Ceylon were begun in 1811 and 1813, respectively. Now the missions of the Methodist bodies of Great Britain, Ireland and Australasia are in all the continents, some of the earlier and most notable successes being in Fiji and other South Sea islands, from which savagery was banished long ago. The various Methodist bodies reported to the Ecumenical Methodist Conference in 1911 an aggregate of $2,540,000 in income for foreign missions which are in the countries of Europe, Asia, Africa, South America and the West Indies.

2. Primitive Methodist Church.— The rise of this body in 1810 was due to the condemnation by the Wesleyan Conference of camp meetings which Lorenzo Dow, an American preacher, had introduced in England, and the exclusion of Hugh Bourne and other ministers for promoting them. The Primitive Church is the largest of the branches which have separated from the original body, having (1916) 205,217 members. It gives a large place to laymen in its government. Hartley College, Manchester, belongs to it.

3. United Methodist Church.— The result of a union of the Methodist New Connexion, formed in 1796 by Alexander Kilham, who was excluded from the Conference for determined opposition to what he called the despotism

the Conference; the Bible Christians, formed in 1810 by William O'Bryan (who had been excluded as a layman) to give more power and opportunity to laymen; and the United Methodist Free Churches, which was itself an organization into which had been merged (1857) several bodies known as "Protestant Methodists," "Wesleyan Methodist Association," "Wesleyan Reformers" and others, all arising out of disciplinary processes by the original body. The Church resulting from the union of 1907 numbered, in 1917, 182,624 members.

4. **Wesleyan Reform Union.**—A small body of 8,770 members, continuing the organization which refused to enter the union of 1857.

5. **Independent Methodist Churches.**—There are 146 of these churches, which are congregational, or independent, with 391 ministers and 9,298 members.

These four bodies have in all 405,949 members. Adding the 853,398 Wesleyan Methodists gives a grand total of 1,259,307 members for the British group, with 6,263 ministers and 16,955 churches. The British group, together with the Australasian, constitutes the Eastern Section of the Ecumenical Methodist Conference, the Western Section consisting of the American churches and the Methodist Church of Japan, which was organized of mission churches of the Methodist Episcopal Church, the Methodist Church of Canada and the Methodist Episcopal Church, South. The Conference meets decennially and is represented in the intervals by an Ecumenical Commission.

Methodism in Australasia.—British Methodism was early planted in the Australasian colonies, the first church in that continent having been formed in 1816. Most of the British branches came in process of time to be represented there, but a union movement which began in 1896 in New Zealand and spread to Australia resulted in a merging of all branches in 1902, save the Primitive Methodists of New Zealand, who maintained a separate existence. There are two bodies:

1. *Australian Methodist Church*, a body of 149,878 members, with 985 itinerant ministers (1917). It has a General Conference, and prosecutes vigorously missions among the natives and the pagan South Sea Islanders and in India. It is also active in education.

2. *New Zealand Methodist Church.*—This body has 24,730 members, with 198 ministers. It manifests missionary zeal and promotes education.

Methodism in America.—The largest group of Methodist churches is that of the United States, consisting of 16 bodies, to which must be added two bodies for Canada and one for Japan, all constituting the Western Section of the Ecumenical Methodist Conference—19 bodies in all, with 8,622,395 members.

1. *Methodist Episcopal Church.*—Immigrants from Ireland and England brought Methodism to the American colonies. The first to land, so far as known, was a company of German Palatines, who had settled in Ireland, and who came thence to America to engage in linen-weaving. The head of the group was Philip Embury, a local preacher, and their class-leader. They arrived at New York in August 1760, probably held meetings occasionally, but formed no society, so far as the record shows, until 1766 when Embury began to preach regularly and formed what was known as the "first Methodist society in America." Two years later the "first Methodist church in America" was built and opened. The third building occupies the original site, and John Street Methodist Church, New York City, is the oldest Methodist society in America. "About the same time," as the historical statement of the Methodist Discipline has it, Robert Strawbridge, a local preacher from Ireland began to preach and form societies at Sams Creek and vicinity, in Frederick County, Md. A log chapel was built soon after. Some claim that the Maryland beginning was prior to that of New York. The matter is in controversy. In response to urgent letters from New York, Wesley sent over (1769) two preachers, Pilmoor and Boardman, to help the "brethren in America." These were followed by others, including a young Methodist preacher from England, Francis Asbury, who arrived in Philadelphia in 1771. All the other men sent by Wesley returned to England before, or at, the outbreak of the Revolutionary War; but Asbury threw in his lot with the Americans and remained to spread Methodism from Georgia to Canada and to the regions beyond the Alleghenies. He organized societies, compiled a book of discipline for their regulation, and administered it with fidelity and firmness. The founder of American Methodism had qualities as a leader and organizer as great, in some respects, as those of Wesley himself, to whom he yielded nothing in zeal, devotion and capacity for work. No man of his time knew the cities, towns and frontier settlements better than Asbury, who held a firm grip of preachers and societies through the formative period, from the time of his arrival in 1771 to the day of his death, 21 March 1816. When he came, 316 Methodists were reported for the American continent; when he died, the number had reached 214,235, surpassing by several thousand the strength of the mother Church in England.

New York, Philadelphia and Baltimore were the early centres of the new denomination; but the greater work was done in the country districts, which, covered with a system of circuits, brought groups of small societies under the care of preachers and multiplied the power of the humble itinerant. The first annual conference was held in Philadelphia in 1773, with 10 preachers, all Europeans, all of the lay order, present. It acknowledged the authority of Wesley and his conference, accepted the doctrine and discipline of British Methodism, forbidding, in loyalty to Wesley, the administration of the sacraments, for which Methodists must look to the Episcopal churches. Opportunities for this were few, and Asbury's iron hand could not always enforce obedience to this rule. Unordained preachers, selected from among converts who had "gifts and graces," served the societies for the next 10 years, there being none others, and none with power to ordain. After the new nation was recognized, the Church was organized. At a general conference of the preachers in Baltimore late in December 1784, a letter was presented from Wesley saying that as the colonies were now independent, both in civil and ecclesiastical matters, he deemed it necessary that the Methodist societies, long deprived of the ordinances, should have them and should have their own

form of government. Having failed to secure ordination for any one from the bishop of London and having for some years been convinced that presbyters and bishops are of the same order, and therefore have the same right to ordain, he had appointed Thomas Coke and Francis Asbury to be joint superintendents in North America. Upon Coke, already a presbyter of the Church of England, he had laid hands in a ceremony of ordination or consecration. The General Conference proceeded to organize the Methodist Episcopal Church, with doctrinal standards, including 25 articles of religion, adopted from the 39 articles of the Church of England, and a discipline. It elected Coke and Asbury as superintendents, or bishops, defining their powers and duties, and Coke ordained Asbury deacon, elder and bishop. This action of the Conference had the effect of settling the controversies which had distracted the societies over the administration of the sacraments, and it provided for ordained men, at a time when such were few and far between, even in the older denominations.

From this time on the Church grew in numbers, annual conferences were created, the itinerancy firmly established, a publishing house set up for denominational literature, schools opened, provision made for training ministers in a course of conference study, and the institutions of an aggressive denomination, including a Church press, home and foreign missions, Church extension, a fund for superannuated ministers, etc., gradually developed.

The peculiar features of the Methodism of Wesley were also those of the Methodism of Asbury: itinerant preachers, whose appointments were changed every year or oftener, then every two years; local preachers from whose ranks the itinerants were recruited; class-leaders for 12 or more members, for prayer, testimony and advice; probation for six months for new converts; Gospel preaching of a fervent type designed to convict of sin and bring repentance and faith in God for salvation and sanctification; a ministry of two orders, deacon and elder, and circuits connecting several societies under one preacher. American Methodism differed from English Methodism in its conference system — quarterly, for the societies, held by the presiding elder; district, for all the societies under the care of the presiding elder; annual, for the itinerants, and general, for legislation and administration and judicial decision; bishops for the whole church, not diocesan, but itinerant. The General Conference, characteristic of all branches, meets once in four years. Lay delegates were admitted in 1872. They equal in number the ministerial delegates.

Its missionary enterprise has been widespread and extensive. It had from 1819 to 1905 one society for home and foreign missions. Since the latter date, it has had a Board of Foreign and a Board of Home missions and Church Extension. The home operations include all classes of population, English and foreign-speaking, also Indian and Negro. For this work the expenditure in 1917, including the Woman's Home Society, was more than $2,400,000. The Foreign Board, together with the Woman's Foreign Society, expended in 1917 $3,716,000. The foreign work, is in Europe — Russia, Finland, Scandinavia, Germany (two annual conferences), Austria-Hungary, Bulgaria, Switzerland, France and Italy — aggregating 74,488 communicants; in Mexico and South America, 18,422 communicants; in India, Burma, Malaysia and the Philippines, 279,646 communicants; in Japan, China and Korea, 82,424; and in Africa, 20,332.

The grand total of Foreign mission communicants is 475,212. The growth of the Church in the United States was almost without parallel. At Asbury's death in 1816 it had 214,235 members; at the end of 1916, 100 years later, it had had, including missions on all continents, save Australia, 4,128,064, notwithstanding losses by repeated division, with 20,503 itinerant ministers, 15,239 local preachers and 30,738 churches, with 4,579,029 in its Sunday schools, and 596,629 in its Epworth Leagues, not including junior members. The estimated value of its church and parsonage property was upward of $250,000,000. Its universities, colleges, seminaries, academies, etc., are numerous, strong, well-endowed and prosperous. Its hospitals, homes for aged and children have come into existence in the last half-century, and are found throughout its boundaries. It is a polyglot Church, having services in German, French, Bohemian, Italian, Spanish, Portuguese, Greek, Swedish, Norwegian, Danish and other European tongues and also in various Indian dialects.

Division has disturbed the Methodist Episcopal Church almost from the first; O'Kelly led out a small company of dissidents in 1793; several organizations were formed before 1820 by withdrawing colored members; a large number were alienated in 1830 as the result of controversy over what was characterized as autocratic rule; later the slavery question became a dividing factor, resulting in a separation in 1841–43, and in 1844–45 in the largest division of all, taking away nearly half of the members reported at that time. Some of the divisions have disappeared, but of those remaining all but one, the Primitive, grew out of differences in government, administration and discipline.

2. *Methodist Episcopal Church, South.*— The existence of slavery in the South after it had ceased in the rest of the States, the struggle to expand it to the border States, and the enforcement of the Fugitive Slave Law sharply accentuated and divided American opinion, and inevitably drew the Churches into the controversy. Anti-slavery sentiment became vigorous and outspoken in the North and roused strenuous opposition in the South. The Methodist Church tried to repress abolition agitation in its ranks, on the one side, and to avoid complicity with the institution, on the other. When Bishop Andrew became a slave holder, through inheritance by his wife, the opposing opinions forced a solution upon the General Conference of 1844. The sentiment of the Northern delegates supported a resolution advising Bishop Andrew to "desist from the exercise of office" so long as he continued to hold slaves. The other bishops united in suggesting that the matter be postponed to the conference of 1848, and that meantime, the work of the bishops be so arranged that Bishop Andrew be given oversight in that section of the country where his services would not meet with objection. But this and other compromises were put aside, under the

fear that otherwise the Church would be broken up in portions in the North, and the resolution was adopted by a vote of 110 to 68. The next day the General Conference refused to say that the action was simply advisory. Thereupon Southern delegates, who had refused to allow Bishop Andrew to resign, entered a protest, and a special committee was appointed to see what could be done. This committee reported a plan of separation which was adopted by a large majority. In the event of the formation of a separate body in the South, the plan provided for an equitable division of the book concern accounts, stock, funds, etc., if the annual conferences should agree to the necessary change in the constitution; those in the South did so agree, but the Northern conferences refused. The General Conference of 1848 declared the "plan" null and void; but meantime the Southern conferences had organized the Methodist Episcopal Church, South.

The new body had in 1846 upward of 455,000 members, including 125,000 negroes. It suffered much in common with other churches in the South during the Civil War, which was fought on territory occupied by it, its losses in members, white, being 112,000 in the period 1860–66; but by 1869 these had more than been made good. Small separations (see CONGREGATIONAL METHODISTS infra) have occurred since, but growth has been continuous and large, reaching 100 per cent in the 30 years ending with 1917, when there were 2,172,628 members, 7,530 itinerant ministers, 1,745,233 scholars in Sunday school, 131,129 members of the Epworth League, 17,376 churches, valued at $63,824,000. It has prosperous home and foreign missions, a full equipment of educational institutions and benevolent organizations. Since Vanderbilt University ceased to be accepted as an institution of the Church, two universities have been established, Emory, at Atlanta and Southwestern, at Dallas, Texas. There are also numerous colleges and other institutions for both sexes. The Methodist Episcopal Church, South, expended in 1917 a total of $1,336,000 on its home and foreign missions which are under one administration. Its foreign missions are in Mexico, Cuba, South America, China, Japan, Korea and Africa.

In doctrine, discipline and government the Church, South, does not differ, except in a few particulars, from the body from which it separated. It gives its bishops a qualified veto over legislation they may deem unconstitutional, there is a limited lay representation in the annual conference, and probation for membership is not required. Appointments of ministers to the same charges is subject to limitation to a term of years, a restriction which the Northern body removed in 1896. A joint commission of 25 from each Church is endeavoring to agree (1918) upon a plan for a reunion of the two Churches, which promises ultimate success. The feeling in the Southern General Conference (Atlanta Ga., May 1918) resulted in a nearly unanimous vote to continue the commission, but there was nothing in the action to remove the deadlock on the race question between the two Churches. The reunited Church would have nearly five and a half million members, with more than 28,000 ministers and 48,000 churches. The plan also provides for a merging of colored bodies in a sectional conference, with representation in the General Conference, which is to unite all the sectional or regional conferences.

3. *Methodist Protestant Church.*— This body was created by a general convention held in November 1830, in Baltimore, of Methodist reformers, most of whom had been expelled or had withdrawn from the Methodist Episcopal Church. They had advocated reduction of the power of bishops; the election of presiding elders, instead of appointment by the bishops; the admission of laymen to all conferences, and various other reforms. They had distinguished leaders, including Nicholas Snethen and Asa Shinn. The new body began its existence with 83 ministers and about 5,000 members, and grew for a time quite rapidly. It admitted laymen to the general and annual conferences, and substituted presidents, elected annually, for bishops, and arranged for the appointment of pastors by a stationing committee. The anti-slavery agitation resulted in a division of this Church (1858) and the creation by the Northern conferences of the Methodist Church. After the close of the war the two Churches were reunited under the original title, which the Southern branch had retained. At the reunion in 1877 there were 116,542 members. The gains in the last 25 years have not been very large. There were in 1915 about 200,000 members, with 1,410 itinerant ministers, including women, and 2,400 churches. There are publishing houses at Baltimore and Pittsburgh, missionary and other denominational societies and educational institutions. Its foreign missions are in Japan, India and China, on which upward of $59,000 was expended in 1917.

4. *Wesleyan Methodist Church.*— Methodist ministers and members, mostly in the State of New York, who demanded the abolition of slavery and were opposed to secret societies, organized this body in 1843. It refused to admit to membership persons connected with slavery or secret societies, and rejected the episcopacy. Within two years after its organization it had 15,000 members; but has grown little since, having in 1916 about 20,000, with 600 ministers and about as many churches. It has a publishing house at Syracuse, N. Y.

5. *Free Methodist Church.*— This body was organized in 1860 by a convention of ministers and laymen, some of whom had been expelled from the Genesee conference of the Methodist Episcopal Church as the result of agitation on subjects of doctrine and practice. Free Methodists insist on non-conformity to the world, plain and simple living, oppose costly churches and emphasize the doctrine of sanctification. They have bishops, elected every four years. Their publishing house is in Chicago. The Church had in 1917 nearly 35,000 members, with 1,250 itinerant ministers and 1,175 churches. It has missions, home and foreign, and educational institutions. It raises nearly $125,000 a year for its foreign missions in China, India, Japan, Africa, the West Indies and Panama.

6. *Primitive Methodist Church,* the result of immigration from England and Canada, and not of any division on this side of the sea. It has two annual conferences and 8,600 members.

7. *Congregational Methodist Church,* the outcome (1872) of withdrawals from the Methodist Episcopal Church, South, on account of ob-

jections to its system of government. A small body known as the New Congregational Methodist Church separated in 1881 from the original body. There was also a colored Congregational body, which has disappeared. The two which remain have together about 18,000 members, mostly in the South. Independent Methodist churches have dwindled to the point of extinction.

Colored Methodist Churches.— Methodism with its fervent appeals and experiences attracted negroes from the first, both North and South. "Black Harry" accompanied Bishop Asbury on some of his journeys, and often spoke with moving power to his own people. Asbury's attitude toward slavery was one of opposition, and he had little or no caste prejudice. Accordingly many negroes became members of the Methodist Episcopal Church, particularly in the cities of New York, Philadelphia and Baltimore. The service of white ministers was not always obtainable or satisfactory, and as early as 1787 some colored people in Philadelphia withdrew and Bishop White, Protestant Episcopal, ordained one of their number to serve them. Bishop Asbury likewise ordained, 1799, Richard Allen, a slave, who had bought his freedom. Including 341,000 colored members in the Methodist Episcopal Church in 1917, and the various distinct colored branches, there are in all about 1,800,000 negro Methodists. (The United States census of 1916 considerably reduces this number, but the Churches say the government figures are too low).

8. *African Methodist Episcopal Church,* organized in Philadelphia, 1816, with Richard Allen, ex-slave, as its first bishop. In doctrines, discipline and government it does not differ materially from the Methodist Episcopal Church, from which it sprang. It has been very prosperous, and under the leadership of Bishop Daniel A. Payne, who graduated from the Reformed Theological Seminary of Gettysburg, it has taken great interest in education. It has four universities, including Wilberforce University, in Ohio. It began foreign missions early in its history in Africa, the West Indies and elsewhere. It has 16 bishops, 5,000 ministers, 6,000 churches and 620,000 members. United States census figures for 1916 are 552,265.

9. *African Methodist Episcopal Zion Church,* organized in New York City as a society for separate worship in 1796, formally as a denomination in 1820. It was the result of a desire of colored members to conduct their own worship. They built a church called Zion and occupied it in 1800. For some years white ministers served it as pastors. Then they secured colored ministers. James Varick was their first bishop. Since 1880 their bishops have been elected for life instead of for four years. It has nine bishops and a full list of denominational boards for its missions and benevolences, and several colleges. It carries on foreign missions in Africa, the West Indies and Guiana. Its publishing house is in Charlotte, N. C. The number of its members, 1915, was 569,000, with upward of 3,500 itinerant ministers and 3,200 churches. The United States census of 1916 cuts down the membership to less than 259,000.

10. *Colored Methodist Episcopal Church,* organized in 1870, under the auspices of the Methodist Episcopal Church, South, of ministers and members connected with the latter body, which reported nearly 208,000 colored members in 1860. Seven years later it had only 54,000, the rest having gone into the various colored churches or into the Methodist Episcopal Church, which created the Freedmen's Aid Society after the war. The Colored Methodist Episcopal Church has grown rapidly, reporting in 1900 about 205,000 members. In 1917 it had 251,560 members, with 3,400 itinerant ministers and 3,285 churches. It has colleges and benevolent societies, eight bishops and a publishing house at Jackson, Tenn.

There are minor colored bodies: (a) Union American Methodist Episcopal Church, beginning in Wilmington, Del., in 1813; (b) African Union Methodist Protestant, dating from 1817; (c) Zion Union Apostolic, organized in 1869; Reformed Methodist Union Episcopal Church with a few members. These bodies have together some 35,000 members.

Methodist Church of Canada.— Methodism reached Canada both from the British Isles and the United States. The first preacher to hold services there was Laurence Coghlan, one of Wesley's preachers, who began work in Newfoundland in 1765. Methodists from John Street Church, New York, arrived in 1783, and Dr. Coke ordained in Baltimore, Md., two men for Nova Scotia. In 1791 the New York conference sent preachers to Nova Scotia and New Brunswick. Bishop Asbury himself visited Canada in 1811. Out of these beginnings came several branches in Canada, the Methodist Episcopal, the British Wesleyan, the Primitive, the Bible Christian and others. The first named became an independent body in 1828 and united, excepting a remnant, with the Wesleyan Church in 1833. In 1874 the Methodist Church of Canada was formed by a union of several bodies, which was made complete in 1883 by the merging with it of other bodies. With the exception of a small colored organization and of a few churches belonging to Methodist Churches of the United States, the Methodist Church of Canada is the one Methodist body north of the border. It has an itinerant general superintendent, a quadrennial general conference, numerous annual conferences, strong educational institutions, home and foreign missions, and a publishing house in Toronto. In 1917 it had 383,103 members, 2,809 itinerant ministers and 3,782 churches. Negotiations have long been pending for a union of this Church with the Presbyterian and Congregational churches. It has been approved by the respective Churches, but has been postponed until the end of the war. The Methodist Church of Canada conducts its missionary operations through one society, assisted by the Woman's organization. Its foreign missions are in Japan and China, on which it expended in 1917 $850,000.

1. *British Methodist Episcopal Church,* a small body of colored members in Canada, with one bishop, one annual conference and 700 members.

2. *Methodist Church of Japan,* an independent Church organized in 1907 of ministers and members of the missions of the Methodist Church of Canada and of the two Methodist Episcopal Churches of the United States. It has a bishop, several annual conferences, 34

ministers, 297 churches and 19,570 members, all Japanese.

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METHODIST EPISCOPAL CHURCH, Board of Education of, a body organized by a committee of the General Conference of 1864 to consider the disposition of moneys raised as educational funds.

METHODIST EPISCOPAL CHURCH, The. See METHODIST CHURCHES OF THE WORLD.

METHODIST EPISCOPAL CHURCH SOUTH. See METHODIST CHURCHES OF THE WORLD.

METHODIST NEW CONNECTION. See NEW CONNECTION METHODISTS.

METHODIUS, mĕ-thō'dĭ-ŭs. See CYRILLUS AND METHODIUS.

METHUEN, mĕ-thū'ĕn, **Paul Sanford,** BARON, English general: b. Corsham Court, Wiltshire, 1 Sept. 1845. He is descended from Sir Paul Methuen who effected the treaty, named after him, between England and Portugal in 1703. He studied at Eton; entered the Scots Guards in 1864; saw special service on the Gold Coast in 1873; received a medal for bravery in the Ashanti campaign in 1874; became attaché in Berlin (1877), assistant quartermaster-general Home District (1881) and quartermaster-general in Egyptian War (1882); won a C. M. G. in Bechuanaland (1885); was in command of the Home District from 1892 to 1897; and commanded one of Buller's divisions in the unsuccessful attempt at the beginning of the South African War to relieve Kimberley. At Magersfontein he was terribly beaten. With Lord Roberts he marched on Pretoria in May 1901. In March 1902 he was captured between Vryburg and Lichtenburg, but immediately released. His ill success in South Africa was attributed to the difficult circumstances, and he was placed over the Eastern Command after the Boer War. In 1907 he was commander-in-chief in South Africa and in 1909 governor of Natal. He received the Grand Cross V.O. in 1910 and was created field-marshal in 1911.

METHUEN, Mass., town, in Essex County, on the Spicket River and on the Boston and Maine Railroad, about two miles north of Lawrence. It was settled in 1641 but was a part of Haverhill until 1725 when it became the town of Methuen. The government is administered, as in the early days, by town meetings. It has a number of manufacturing establishments, chief of which are cotton and woolen factories, bell foundry, organ factory, knitting mills, hat factory, worsted goods and yarn factories and basket factories. It has good schools and the Nevins Memorial Library. Pop. about 14,000.

METHUEN TREATY, a commercial treaty between Great Britain and Portugal, signed in 1703 and annulled in 1835, having to do with the tariff on wines and wool. It was negotiated by Sir Paul Methuen, the British Ambassador to Portugal.

METHUSELAH, mĕ-thū'sĕ-lą ("a man with a dart?"), Hebrew patriarch. The name appears in old manuscripts also as Mathusala

and Mathusale. It has been variously translated as "Man of God," "Man of the Javelin," "Man of Sin," "Man of Selah." Because Selah was a title of the god Sin, these other derivations are possible. He is remarkable as the oldest man mentioned in the Bible, his age being stated in Genesis v, 27 as 969 years. According to Hebrew chronology and to that of the Samaritan version (which, however, reduces his age to 720 years), he died in the year of the Flood; but the Septuagint calculation makes him die six years earlier. Few will be found who believe that a man ever attained such an age. The most rational conclusion is that the original writer had in mind a period different from the year of 365 days. Consult Langdon, S., in 'Proceedings of Biblical Archæology' (London 1914).

METHYL ALCOHOL. See ALCOHOL and METHYL.

METHYL AND ITS DERIVATIVES, *in chemistry;* this name is given to the hypothetical radical CH_3, assumed to exist in methylic alcohol and in very many other carbon compounds. Methyl forms the first of the series of alcohol radicals, the general formula of which is C_nH_{2n+1}, and gives rise to an almost innumerable list of compounds. In the year 1848 Frankland and Kolbe, by the action of potassium on ethyl cyanide, obtained a gas the composition of which agreed with the formula C_2H_6; now such a body may be regarded either as (1) ethyl hydride $C_2H_5.H$, or (2) as two atoms of methyl linked together to form one molecule.

$$\begin{matrix} CH_3 \\ | \\ CH_3 \end{matrix}$$

For a considerable time the new substance was supposed to be free methyl, that is —

$$\begin{matrix} CH_3 \\ | \\ CH_3 \end{matrix}$$

and to be isomeric, but not identical with ethyl hydride $C_2H_5.H$.

According to the generally received views concerning atomicity (see CHEMISTRY) such a body as CH_3 could not exist in the free state; it was therefore in keeping with chemical theory to believe that in the moment of its liberation the atoms of this substance should combine together in pairs to form the stable molecule —

$$\begin{matrix} CH_3 \\ | \\ CH_3 \end{matrix}$$

A few years later Frankland succeeded in preparing the same body by the action of zinc on ethyl iodide, $Zn + 2CH_3I = ZnI_2 + 2CH_3$. Frankland compared the action of chlorine on this supposed $2CH_3$ with the action of the same gas on the so-called ethyl hydride ($C_2H_5.H$), and concluded that the two bodies were not identical. Schorlemmer has, however, studied this action of chlorine more carefully, and he finds that the resultant substances are the same in each case. The reactions which take place between equal volumes of chlorine and of the gas C_2H_6 may be thus formulated:

(1) $C_2H_6 + Cl_2 = C_2H_5Cl + HCl$.

(2) $C_2H_5Cl + Cl_2 = C_2H_4Cl_2 + HCl$.

The first reaction is the principal one; small quantities of the body $C_2H_4Cl_2$ (dichlorethane) are, however, always formed. The identity of the two substances formerly known as free methyl and ethyl hydride has been disproved, so that we now know of only one body having the formula C_2H_6; to this substance the name of ethane is given; it forms the second hydrocarbon in the marsh-gas, or C_nH_{2n+2} series. From these considerations it is evident that the radical methyl is known only in combination with other bodies. By the action of chlorine on certain methyl compounds the body CH_2Cl is obtained, from which again the bodies CH_2Cl_2, $CHCl_3$ and CCl_4 may be produced. The oxide of methyl $(CH_3)_2O$, or methylic ether, is produced by the action of sulphuric acid upon wood spirit; this ether may be taken as typical of a large series, in which one of the groups CH_3 is replaced by another radical (either alcoholic or acid). The hydroxyl derivative of methyl, or methylic alcohol, CH_3OH, is prepared in many ways. The most generally employed method consists in rectifying the product obtained by the dry distillation of wood (hence its common name — wood alcohol or wood naphtha); but in order to obtain perfectly pure methyl alcohol it is necessary to prepare a methylic ether, generally methyl oxalic ether, decompose this by distillation with water, and dehydrate the alcohol so obtained by means of quicklime. Methylic alcohol is a colorless mobile liquid, having a specific gravity of .8142 at 32° F.; its boiling point lies about 140° F. It mixes with water in all proportions with the evolution of heat. It burns with a clear blue flame. It is a ready solvent for fats, resins, camphors and fatty oils. The presence of a certain amount of methylic alcohol in ordinary or ethylic alcohol does not interfere with the use of the latter substance in many chemical operations. Such a mixture is known in commerce under the name of *methylated spirit.* Methylic alcohol yields by oxidation formic acid (CH_2O_2), thus $CH_4O + O_2 = CH_2O_2 + H_2O$.

Another important series of methyl derivatives consists of substances known as *methylamines;* these are strongly basic and are generally regarded as ammonia in which one, two or three hydrogen atoms are replaced by one, two or three atoms of the radicle CH_3, thus giving rise to two other groups — the dimethylamines and the trimethylamines. Thus we know of the substances NH_2CH_3, $NH(CH_3)_2$, and $N(CH_3)_3$. Further, as we know of such bodies as ammonium iodide and chloride, so we are acquainted with the corresponding methyl-ammonium salts $N(CH_3)_4I$ etc. Methylene is a colorless gas with a strong odor resembling ammonia. It is highly inflammable, and burns with a yellow flame. The group CH_3 may also be introduced into many of the natural alkaloids (see STRYCHNINE), giving rise to methyl derivatives of these bases. Another extensive series of derivatives are the methylenes, of large importance in the manufacture of dyestuffs.

METHYLATED SPIRIT, alcohol or spirit of wine containing 10 per cent of wood naphtha, which contains a large proportion of methylic alcohol (see METHYL). It is much used in the arts as a solvent, for preserving specimens, in the manufacture of varnishes and for burning in spirit and other lamps.

METHYLENE, Bichloride of, an organic compound of great value as an anæsthetic. It is a colorless fluid having an odor like that of chloroform, and is pleasant to inhale.

METHYLENE BLUE, an aniline dye a bluish crystalline powder having a bronze-like lustre. It is used in medicine, and in malaria is given as a substitute for quinine. See DYES.

METIS, mē'tis, *in ancient mythology,* the first wife of Jupiter, whom he was said to have devoured, after which Minerva (q.v.) was formed within his head.

METLAHKATLA, mĕt-lä-kä'tlä, or **METLAHKATLAH,** the native name of the oldest and most successful mission among the Indians of British Columbia, founded in 1857, by William Duncan, an English missionary, who developed a model community from a tribe of the lowest cannibals. A government school was opened there in 1913. Consult Arctander, K. J., 'Apostle of Alaska' (New York 1909).

METONIC CYCLE, a period of 19 solar years, after which the new and full moon fall on the same days of the year as they did 19 years before. This cycle was the discovery of Meton, a celebrated Athenian mathematician, 432 B.C. The Metonic cycle contained 6,940 days, which exceeds the true length of 19 solar years by 9¼ hours nearly. On the other hand, it exceeds the length of 235 lunations, or synodic revolutions of the moon, by 7½ hours only. In the ecclesiastical calendar the number of the year in the cycle is called the golden number (q.v.). The cycle is supposed to commence with the year in which the new moon falls on the 1st of January.

METRE, mē'tėr, the unit of length in France,=39.37079 English inches, roughly one yard 3 1/3 inches. The metre was intended to be the ten-millionth part of the quadrant of a meridian of the earth. The *centimeter,* the one-hundredth part of a metre or nearly 4/10ths of an inch, possesses more advantages in physics as a unit of length; it is also found very convenient for many purposes for which the English yard is employed. See METRIC SYSTEM; WEIGHTS AND MEASURES.

In music, the equalization of time in the division of a composition. The measure (q.v.) is the smallest element in metre; two measures make a *section,* two sections make a *phrase* and two phrases make a *period.* See MUSIC.

In poetry, that measure of verse that determines the rhythm. It is commonly divided into feet and lines; a series of feet is a colon. See POETRY.

METRIC SYSTEM, The. In the latter half of the 17th century, the French astronomer, Jean Picard (1671), and the Dutch physicist, Christian Huyghens (1673), proposed as a standard unit of length that of a seconds pendulum at sea-level on the 45th degree of latitude. This is only about six millimeters shorter than the meter now in use. Some years earlier, Sir Christopher Wren had advocated that a half-seconds' pendulum should be chosen as such a unit; this would have approximated one-half the length commonly given to the ancient cubit. In 1670 the French mathematician, Abbé Gabriel Mouton, had suggested as a length unit one minute of the earth's circumference, what is now in use as a geographical mile, and he had divided and subdivided this decimally, giving a good Latin terminology for the various divisions and multiples. However, more than a century was to elapse before, under the inspiring influence of the spirit of innovation born of the French Revolution and its precursor, the American War of Independence, a new, scientific and logical system of weights and measures was created, one which has already replaced the old and illogical systems in a great part of the world and is probably destined to become, before many years shall have passed, the universal system. In view of the opposition to any change in this direction still shown by many to-day in England and the United States, it is a strange coincidence that in the very year (1790) when the first steps leading to the establishment of the metric system were taken in France, a new system of weights and measures was offered by John Miller to the British House of Commons, and also by Thomas Jefferson, the Secretary of State, to the House of Representatives of the United States. Jefferson's report formulated a decimal division of the various units. A still closer approximation to the metric system was present in that proposed by the inventor, James Watt, who selected as the unit of mass a definite volume of water, and provided for a simple interrelation of the units of length, area, volume and mass; he communicated this to Talleyrand.

As has been stated, it was in 1790 that the project for a new system of weights and measures was taken up by the French National Assembly. In March of that year, Talleyrand published a proposition to this effect, which he and Prieur des Vernois submitted to the Assembly. That body after referring the project to the Committee on Agriculture for preliminary consideration took it up on 8 May 1790 and on 22 August, a decree, sanctioned by Louis XVI, provided for the establishment of a new system, invited other nations to participate in the project and entrusted to the Académie des Sciences the task of determining on the unit to be employed as a standard. Some representatives from Spain, Italy, Denmark, the Netherlands and Switzerland took part in the discussion of the plan. The Académie des Sciences, in accord with the provisions of the decree, appointed a committee composed of the scientists Borda, Lagrange, Lavoisier, Tillet and Condorcet, and on 27 Oct. 1790, this committee submitted its report to the Assembly. To secure additional data, a second committee was appointed, in which Laplace and Monge were substituted for Lavoisier and Tillet. This second committee, in its report of 19 March 1791, recommended the adoption of the one ten-millionth part of the quadrant of the terrestrial meridian as the standard unit of length. The Assembly accepted this suggestion, and on 26 March 1791 appointed five commissions, each charged with some department of the arduous task. It was decided to make, as an exact basis of calculation, a measurement of an arc of 10 degrees on the meridian of Paris. The composition and attributions of the commissions were as follows:

1. Cassini, Méchain, Legendre; to measure the difference of latitude between Dunkirk and Barcelona, and to compute the triangles.

2. Monge and Meusnier; to compute the bases.

3. Borda and Coulomb; for the observation of the pendulum.

4. Lavoisier and Haüy; for researches as to the weight of distilled water.

5. Tillet, Brisson and Vandermonde; for comparison of ancient measures.

On 1 Aug. 1793, the Convention passed a decree, on the proposition of Arbogast, to the effect that the use of the new system should be declared obligatory at the end of the year. In this decree the nomenclature of the system was determined. Unavoidable delays in the measurement of the arc necessitated some successive modifications, and it was not until the 11th Ventôse, An III (1 March 1795) that an approximately definite report was sent in, to be followed by the decree of 18th Germinal, An III (7 April 1795), which finally established the different parts of the metric system. Lavoisier and Haüy were assisted by Le Fevre-Gireau and Fabbroni in determining the exact weight of a definite volume of water.

The decree of 7 April ordered the continuation of the operations for the exact determination of the units, and to this end provided for 12 commissions to be named by the Committee of Public Instruction. The members chosen were: Berthollet, Borda, Brisson, Coulomb, Delambre, Haüy, Lagrange, Laplace, Méchain, Monge, Prony and Vandermonde. On 16 July 1795, Borda and Brisson presented their report of the verification of the meter, but the measurement of the meridian arc, begun by Delambre and Méchain, 25 June 1792, could only be terminated in 1799. It is interesting to learn that, some years later, the work was continued in the Balearic Islands by Biot and Arago.

As a first step in the legislative enforcement of the system, a decree of 23 Sept. 1795 (1st Vendémiaire, An IV) had provided that its use should be obligatory in the commune of Paris, and in the 'Constitution de l'An IV (1795–96)' its principle was formally recognized. On 16 Oct. 1798 (25th Vendémiaire, An VII), there assembled in Paris a body composed of the delegates of 10 independent nations, designated to establish finally the fundamental units. The report, made in the following year by Van Swinden, of the Batavian Republic, gave the conclusions arrived at, and determined the length of the meter as 443 296/1000 lines of the old "Toise de Pérou," the latter being approximately equivalent to 6.3944 English feet. This report was adopted by the Convention 22 June 1799 (4th Messidor, An VII), and the prototypes in platinum of the meter and kilogram were presented by the Institute. They were immediately deposited in the Palais des Archives of Paris, copies being placed in the Conservatoire des Arts et Métiers, and in the Observatory of Paris, while iron meters were consigned to several foreign countries, including the United States.

It is well worthy of note, in view of the eventual absolute success of the metric system, that at first its progress was slow. For quite a time the people continued to cling to the old measures, and this led, under the First Empire to the promulgation of a ministerial edict, dated 28 March 1812, authorizing the employment of "transitory measures"; among which were the use of a *toise* (fathom) of 2 meters (the actual length of the old *toise* was 1.949 meters), of an *aune* (ell) of 1.20 meters, of a *boisseau* (bushel) of 12.5 liters, etc. It was not until the monarchy of Louis Philippe that absolutely final and decisive action was taken in the matter. The Marquis de Laplace presented to the Chamber a report, upon which was based the law of 4 July 1837, according to the terms of which "all weights and measures except those established by the laws of 18th Germinal, An III and of 19th Frimaire, An VIII (7 April 1795 and 10 Dec. 1799)" should be prohibited after 1 Jan. 1840. Belgium, Holland and Greece were the first countries to adopt the metric system, and before the end of the 19th century, it had become the standard with 40 nations, and had attained world-wide use in science.

Nearly a score of years before the passage of the French law just mentioned, the movement for the adoption of the system in the United States had already found able advocates, one of the most notable being John Quincy Adams who in a report made to the Senate, on 22 Feb 1821, proposed that an international conference should be held to study the merits of the metric system and to provide for co-operation with France tending toward its universal adoption. In the same year two metric standards, made of platinum, were sent to the United States by Albert Gallatin (1761–1849), then Minister to France. They were both authenticated by a certificate from the great physicist Arago, stating of the kilogram that it differed less than 1 milligram from the original "kilogramme des Archives." In form it is a cylinder with flat bases, the edges slightly rounded. Height and diameter are nearly equal, approximately 39.5 millimeters each. The only distinguishing mark is a faint lathe or tool mark of a point within a circle. The square mahogany box in which it was placed bore the following words engraved on a silver plate attached to the cover: "Kilogramme comparé pour son Poids a l'Etalon Protype des Archives de France, et vérifié par M. Arago. Fortin fecit." Despite the assertion that its variation from the standard was but 1 milligram, it was found, when compared in 1879 with the British platinum kilogram, to be 4.25 milligrams light, and this finding was confirmed in 1884, when it was taken to the International Bureau of Weights and Measures at Sèvres, and compared with two auxiliary kilograms known to have the same values as the kilogram of the Archives. The final determination gave the error as −4.6 milligrams. The intrinsic worth of this platinum kilogram to-day, with the metal quoted at $.65 per ounce Troy, would be $3,375, while at the time it was made the value would hardly have exceeded $300.

Older than the Arago kilogram is the "committee meter," as it has been called, which was given to Mr. F. R. Hassler, later superintendent of the Coast Survey, by J. F. Tralle, the deputy from the Helvetic Republic in the committee charged with providing for the production of the metric standards in 1799. It was brought by Mr. Hassler to the United States in 1805, and was a short time later donated by him to the Philosophical Society of Philadelphia. Not long afterward, when Mr. Hassler took

up the Coast Survey work, the society placed this standard at his disposal, and until 1890 it served as the standard for the determinations made by the survey. This meter is made of iron, and is marked with the stamp of the committee, which was a small ellipse, having three quadrants shaded, the remaining one bearing the figures 10,000,000, that of the number of meters in a quadrant of the earth's meridian.

Almost a half century elapsed after the proposal of a metric conference by John Quincy Adams before this project was realized. On 1 Sept. 1869, a decree of Napoleon III summoned an international conference to provide for the production of new and absolutely exact metric standards of mass and length. Fifteen nations responded to this invitation, and the delegates assembled in Paris, 8 Aug. 1870. In spite of the fearful disasters of the French armies and the consequent rapid invasion of French territory by the Germans, five meetings were held before the conference was forced to disband. The following were the 15 countries accepting the invitation of the French government to send representatives to this first Paris conference, of August 1870: Austria, Ecuador, France, Great Britain, Greece, Italy, Norway, Peru, Portugal, Russia, Spain, Switzerland, Turkey, United States, Colombia.

The project was not abandoned, however, and a second conference was called two years later, under the Third Republic, and representatives of 30 nations assembled in Paris on 24 Sept. 1872, remaining in session until 12 October of that year. Their deliberations resulted in the adoption of 40 resolutions bearing on the construction of the new standards; of these 21 especially applied to the meter and 12 to the kilogram, the remainder referring to various details of the plan to be pursued, and to the precautions to be taken for the preservation of the standards when produced, as well as for the maintenance of their invariability. A most important point was the exact determination of the alloy to be employed, and the eventual decision was that it should be one of 90 per cent platinum and 10 per cent iridium, a tolerance of 2 per cent in excess or deficiency being permitted. This alloy possessed at once a high degree of hardness and of resistance to chemical action, and also was susceptible of receiving an exceedingly fine finish. A main share in the task of ensuring the production of a thoroughly satisfactory amalgamation of the metals was entrusted to the chemist, Henri Sainte-Claire Deville. The first ingot made had a weight of 238 kilograms and is commonly known as the "alloy of 1874," from the year in which it was produced. This alloy, however, did not meet with the approval of the commission, although several standards were made out of it to test its qualities. It was now determined to have recourse to the skill and experience of the great London firm of platinum refiners, Messrs. Johnson, Matthey and Company, and as a result of patient effort they were finally able to offer a casting which was found by the chemists of the International Commission, and by those of the French section, to exceed the requirments; from it were made 31 prototype meters and 40 kilogram weights. The meters were sent, early in 1887, to the International Bureau to be compared with the "mètre des Archives" and also with one another. By 1889 this task had been accomplished, and on 26 September of that year the work of the International Committee received the approval of a general conference assembled at Paris. The meter and the kilogram found to be in closest agreement with the meter and kilogram of the Archives were denominated the "International Meter," and the "International Kilogram," and were deposited at the International Bureau of Weights and Measures, in a vault provided with three separate locks, the keys to which are in the possession, respectively, of the Custodian of the Archives of France, the president of the International Committee and the director of the International Bureau. This vault must not be opened oftener than once in a year, and in the presence of the three officers to whom the keys have been confided. To each of the contributing countries were given two of each of the new standards, which were all accompanied by attested certificates of comparison, two hard glass thermometers, each of which had a table of corrections in terms referring to the hydrogen scale, and a piece of the alloy cut from the end of the bar and destined to be used in testing the coefficient of expansion; each kilogram had a rock-crystal bedplate and other requisites for its safe conveyance. The meters allotted to the United States, Nos. 21 and 27, bore corrections of +2.5 microns and —1.6 microns, respectively; the probable error of the determinations being estimated, as a result of 784 individual comparisons, at less than 0.2 microns. The two kilograms assigned were numbered 4 and 20, and had corrections in weight of —0.075 and 0.039 milligrams, and in volume of 46.418 and 46.402 milliliters, respectively. Here from 1,092 individual weighings the error of the determination is less than 0.002 milligrams. Meter No. 27 and Kilogram No. 20 were carefully packed and brought to this country under seal by George Davidson of the Coast and Geodetic Survey. On 2 Jan. 1890, President Harrison received them at the Executive Mansion. The seals were broken in his presence, and he gave a certificate to the effect that they had been received in good condition, and that he was fully persuaded they were the standards to which the report referred. The other kilogram and meter were received in July 1890, and were deposited in the Office of Weights and Measures where the meter and kilogram recognized by the President as national standards had already been placed. By a decision made by the superintendent of weights and measures, on 5 April 1893, and approved by the Secretary of the Treasury, the international meter and kilogram were made the fundamental standards of length and mass in the United States, this applying to the customary weights and measures as well as to those based on the metric units. The standards passed under the control of the Bureau of Standards on its establishment 1 July 1901, pursuant to the provisions of the act of 3 March 1901.

The International Prototype Meter is an irido-platinum bar, 102 centimeters in length. Three lines are engraved near each end of the bar; they are from six to eight microns wide, and about one-half millimeter apart, and the meter is defined as the distance between the middle line of each group, when the temperature of the bar is at 0° C. The lines used to define

the meter and its subdivisions were traced at the Conservatoire des Arts et Métiers in Paris.

While the preliminary work for the production of the new standards was in progress, in March 1875, another international conference was called by the French government, in which France, the United States and 15 other nations out of the 19 represented signed a convention on 20 May 1875, providing for the establishment and support of a permanent International Bureau of Weights and Measures, the management and control of which should be in the hands of an international committee having 14 members, each from a different country. As a site for this bureau, the French government assigned a piece of ground at Sèvres, in the Park of Saint Cloud, declaring it to be neutral territory. It was agreed that the expenses of the bureau were to be borne by contributions paid by the contracting governments, the amount being proportionate both to the population of the country and the extent to which the metric system was used there.

The routine work of the bureau is performed under the supervision of a body termed the International Committee of Weights and Measures. This is in turn subject to the control of a general conference to which all the contracting governments send delegates, and which is to meet at least once every six years. This conference is charged will all questions regarding the measures to be taken to spread the use of the metric system in the countries which have not yet adopted it, and it is also called upon to pass definitely upon any new fundamental determinations that may be proposed.

The Advantages of the Metric System and its Proposed Adoption by the United States and Great Britain.— The initial difficulty and expense incident to a substitution of the metric system for that now in use in the United States and Great Britain have been much exaggerated by many writers on the subject. There would be no necessity for absolutely replacing the machinery appliances now in use; all that would be needed in the great majority of cases would be to re-mark them in accordance with the metric scale, and to adjust their operations in accord with metric requirements. It has indeed been truly said that the only machines that would altogether lose their usefulness would be those for making the old measures. It need never be necessary to change the present lathes, drills, shapers, etc., since there would be no necessity for the manufactured objects to have a particular metric size; all that would be needed would be to have them marked and listed in the metric designations of their actual size. It should be borne in mind, in this connection, that at present the sizes of parts are seldom exact unit sizes, since they are not made to conform to an arithmetical rule but to the exigencies of their practical mechanical use.

The metric system finds an earnest advocate in Hon. William C. Redfield, Secretary of the Department of Commerce. In an address at the Fifth Annual Meeting of the Chambers of Commerce of the United States, in Washington, on 2 Feb. 1917, he said of our present system of weights and measures that it «stands as a bar across that path to foreign trade which it is necessary that we should tread.» In another address, made before the Philadelphia Chamber of Commerce, 10 Jan. 1917, he noted that it required four pages of an official publication to describe the various kinds of bushels that exist in America, and that the Philadelphia mint buys all its supplies and common metals by one kind of weights and measures, its precious metals by another, and does all its laboratory work by a third, this latter being, of course, the metric system. As at least a step in the right direction, he cites the frequent use in drawings of a decimal division of feet and inches.

As to the best means of generalizing the use of the metric system in the United States, Dr. Samuel W. Stratton, director of the Bureau of Standards, writes: «Commerce, technology, and science have, on account of their international character, availed themselves of the advantages of the metric system more than manufacturing, which is local, and, unlike exporting, not in direct touch with world markets. Hence science and commerce with their world-wide outlook should be the advisers of industry, and their conclusion is that the first principle is to supply what the customer needs, and that international business requires international weights and measures.»

As to one of the great merits of the system, we have the following emphatic opinion from the late Lord Kelvin (William Thompson, 1824–1907): «I believe I am not overstating the truth when I say that half the time occupied by clerks and draughtsmen in engineers' and surveyors' offices — I am sure at least one-half of it — is work entailed upon them by the inconvenience of the present farrago of weights and measures. The introduction of the French Metrical System will produce an enormous saving in business offices of all kinds — engineering, commercial, and retail shops.»

The Rt. Hon. Arthur J. Balfour, replying in 1895 to a deputation advocating the introduction of the system in England, used the following words: «Upon the merits of the case I think there can be no doubt whatever that the judgment of the whole civilized world, not excluding countries which still adhere to the antiquated systems under which we suffer, has long decided that the metric system is the only rational system.»

As a step in the direction of the metric system, the decimalization of the coinage has found some favor in England recently, the present florin (a two-shilling piece) being proposed as a new monetary unit since it is exactly one-tenth of a pound sterling. As the British farthing is one ninety-sixth of a florin, an exceedingly trifling reduction of its value would make of it a «cent» representing the one-hundredth part of the florin, and worth only a very small fraction less than one-half of the United States or Canadian cent. Another idea has been to add ten-pence to the value of the pound, which would then contain 250 pence or 1,000 farthings of unchanged value. A new florin, as the tenth of this new pound, would then be worth 100 farthings. It is interesting to note that the proposition to decimalize the British coinage by making the florin, the tenth part of a pound sterling or sovereign, a money of account, and sub-dividing it into hundredths, has for several years been essentially introduced in Peru, where

the gold *libra*, coined as an exact equivalent of the British pound sterling, is divided into 10 silver *soles*, the sol thus being worth exactly $0.48665, or the same as the British florin. The sol is in turn divided into 100 *centavos* worth 0.48665 cent of our money.

Probably no profession would benefit to a greater extent by the introduction of the metric system in the United States and Great Britain than would that of mining-engineering. This is eminently an international science, and to maintain a place in the first rank of his profession the mining engineer must keep himself constantly informed as to the latest methods and improvements introduced in foreign lands. Wherever the metric system is employed, all the data on this profession are expressed in metric weights and measures. When, however, the United States engineer wishes to use these data in connection with his own work, or to compare them with those recording native methods and machinery, he is forced to make a number of very tedious calculations before he can arrive at any exact comparisons. An approximate idea he may indeed quickly gain, but in any exact science all mere approximations are practically useless.

The metric system has for some time been in exclusive use in the medical department of the United States army, and with the entry of the United States into the war against the Central empires, it was used in the manufacture of certain sizes of guns, notably in those conforming to the famous French "75's," the 75-millimeter guns that have proved their superiority to the other field artillery of similar size and also of the 105 millimeter and the 155 millimeter guns. The General Chief of Staff wrote in January 1918, that it was followed in the preparation of operation orders and in map construction for the troops in France, as well as for firing data for artillery and machine guns to be used there. The artillery and machine gun material intended for service abroad was modified to conform with metric measurements.

Another step in furtherance of the adoption of the metric system is one that has recently been taken in the gem-dealers' industry. This concerns the adoption, in precious stone commerce, of an international metric carat of 200 milligrams, to take the place of the various and discrepant national carat-weights that have for so long been sources of serious annoyance, inconvenience and loss of time for gem-dealers. In a paper read in Chicago before the International Congress of Weights and Measures, held in connection with the World's Columbian Exposition of 1893, the writer suggested dividing the carat into 100 parts, and constituting a standard international carat of 200 milligrams, that is, 5 carats, or 20 pearl grains, to a French gram. This represented a depreciation in weight of only about 2½ per cent from the carat-weights most in use. Great credit for having definitely initiated this much-needed reform is unquestionably due to M. C. E. Guillaume, Director of the Bureau International des Poids et Mesures at Sèvres, who energetically and successfully advocated the reform in 1906 before the Commission des Instruments et Travaux, in Paris.*

Simplicity of the Metric System.— There is only one system of weights and measures in the world by means of which, if a voyager were wrecked on a desert island with only one measure, and that so small that it could be put in a lady's thimble, he could reconstruct all the measures for distance, for weight and for capacity, could map out the island, weigh up to tons and know the capacity of any receptacles he might construct. That system is the metric system, and that measure is the cubic centimeter, made hollow, and graduated on the edge in millimeters.

Having this, he could mark a stick up to a meter, dividing it into decimeters, centimeters and millimeters. This meter multiplied a thousand times would give him the kilometer — the standard measure of distance. It would also enable him to determine how many square meters the island measured, and hence how many ares (100 square meters) and hectares (10,000 square meters) it covered in area. Or, he could fill the cubic centimeter with water, which would weigh one gram, and multiplying this by a thousand would give him a kilogram, the standard measure of weight. The cubic centimeter would hold one milliliter of water and 1,000 milliliters would give him the liter, the standard measure of capacity.

The meter for the unit of length, the liter for the unit of capacity and the gram for the unit of mass or weight is the sum and substance of the metric system. These three units (meter, liter, gram) with the following divisions and multiples are winning their way into general use because they are best suited for practical purposes.

The prefixes from the Latin, milli; centi; deci; representing respectively a thousandth, a hundredth and a tenth, and those from the Greek, deka, hecto and kilo representing respectively 10, 100 and 1,000 may be used with any of the metric units. Investigation and experience in the United States and in metric countries, however, indicate the desirability of holding to the metric weights and measures given in the foregoing table, as these are considered sufficient and best for professional work, the industries and trade. Ten meters, for instance, is briefer and more readily understood than one dekameter.

The metric weights and measures were all based on the unit of length. The liter, the unit of capacity, is almost exactly equivalent to a cubic measure 10 centimeters on each edge or 1,000 cubic centimeters (cm^3 or cc). As greater accuracy could be obtained by basing the unit of capacity upon the unit of mass, the definition was written as follows: "A liter is a unit of capacity equivalent to the volume occupied by the mass of one kilogram of pure water at its maximum density at a temperature of 4° C. (39.2° F.) and under the standard atmospheric pressure of 760 mm." One milliliter, equivalent to 1.000027 cubic centimeters of water, weighs one gram. Technically, however, the gram is one thousandth of the kilogram, which is the standard for mass or weight.

* G. F. Kunz, The International Language of Weights and Measures,' *The Scientific Monthly*, Vol. IV, No. 3, March 1917, pp. 215–219, paper read, as retiring chairman, before Section I (Social and Economic Science) of the American Association for the Advancement of Science, in New York City, 27 December 1916.

TABLE OF THE METRIC SYSTEM AND EQUIVALENTS.

	Correct English spelling		Standard abbreviations
Length	10 millimeters	= 1 centimeter	10 mm = 1 cm
	100 centimeters	= 1 meter	100 cm = 1 m
	1000 meters	= 1 kilometer	1000 m = 1 km
Capacity	1000 milliliters	= 1 liter	1000 ml = 1 l
Weight	1000 milligrams	= 1 gram	1000 mg = 1 g
	1000 grams	= 1 kilogram	1000 g = 1 kg
	1000 kilograms	= 1 metric ton	1000 kg = 1 t

LENGTH.

1 centimeter	= 0.3937 inch	1 inch	= 2.5400 centimeters
1 meter	= 3.2808 feet	1 foot	= 0.3048 meters
1 meter	= 1.0936 yards	1 yard	= 0.9144 meters
1 kilometer	= 0.6214 statute mile	1 statute mile	= 1.6093 kilometers
1 kilometer	= 0.5396 nautical mile	1 nautical mile	= 1.8532 kilometers

CAPACITY.

1 milliliter	= 0.0610 cubic inch	1 cubic inch	= 16.3867 milliliters
1 milliliter	= 0.2705 U. S. fluid drachm	1 U. S. fluid drachm	= 3.6966 milliliters
1 milliliter	= 0.0338 U. S. fluid ounce	1 U. S. fluid ounce	= 29.5729 milliliters
1 liter	= 1.0567 U. S. liquid quarts	1 U. S. liquid quart	= 0.9463 liter
1 liter	= 0.9081 U. S. dry quart	1 U. S. dry quart	= 1.1012 liters
1 liter	= 0.2642 U. S. gallon	1 U. S. gallon	= 3.7853 liters
1 milliliter	= 0.2816 British fluid drachm	1 British fluid drachm	= 3.5515 milliliters
1 milliliter	= 0.0352 British fluid ounce	1 British fluid ounce	= 28.4123 milliliters
1 liter	= 0.8799 British liquid quart	1 British liquid quart	= 1.1365 liters
1 liter	= 0.2200 British imperial gallon	1 British imperial gallon	= 4.5460 liters

MASS OR WEIGHT.

1 gram	= 15.4324 grains	1 grain	= 0.0648 gram
1 gram	= 0.6430 pennyweight	1 pennyweight	= 1.5552 grams
1 gram	= 0.7716 apothecaries' scruple	1 apothecaries' scruple	= 1.2960 grams
1 gram	= 0.2572 apothecaries' drachm	1 apothecaries' drachm	= 3.8879 grams
1 gram	= 0.0353 avoirdupois ounce	1 avoirdupois ounce	= 28.3495 grams
1 gram	= 0.0322 troy ounce	1 troy ounce	= 31.1035 grams
1 kilogram	= 2.2046 avoirdupois pounds	1 avoirdupois pound	= 0.4536 kilogram
1 kilogram	= 2.6792 troy pounds	1 troy pound	= 0.3732 kilogram
1 metric ton (1000 kilograms)	= 0.9842 long tons (2240 lbs.)	1 long ton	= 1.0160 metric tons (1000 kilograms)
1 metric ton	= 1.1023 short tons (2000 lbs.)	1 short ton	= 0.9072 metric ton

The equivalents given in this article are based upon the following fundamental equivalents:

39.370000 United States inches	= 1 meter
39.370113 British inches	= 1 meter
0.2641776 United States gallon	= 1 liter
0.2199753 British Imperial gallon	= 1 liter
1 United States avoirdupois pound	= 0.4535924277 kilogram
1 British avoirdupois pound	= 0.4535924300 kilogram

A quantity can usually be expressed as a whole number if the proper metric weight or measure is selected. Even when a fraction is needed to express the metric equivalent of another weight or measure, one or two figures to the right of the decimal point generally give sufficient accuracy. Equivalents such as those in the tables here given are intended to be used only to the required degree of accuracy. For example, four inches is equal to about 10 centimeters; if greater accuracy is desired 10.2 centimeters or 102 millimeters may be taken.

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GEORGE F. KUNZ.

METROPOLIS CITY, Ill., city, county-seat of Massac County, on the Ohio River, here spanned by a fine modern bridge, and on the Illinois Central and the Chicago, Burlington and Quincy railroads, about 190 miles south by east of Springfield. It is in a healthful locality built on a high bluff, with an incline toward the river. The site was selected in 1700 by the French, when Fort Massac was erected; but no permanent settlement was made until 1838. It was incorporated in 1843. The city has lumber mills, basket and box factories, flour mills, potteries, veneer and furniture factories, and municipal electric light and water plant. The city is the trade centre for nearly all of Massac County and is an active shipping point in all directions by rail and water. The form of government is aldermanic. There are good schools, the R. W. McCartney Public Library, the Odd Fellows' Temple, a sanatorium, a city hall, courthouse, music-hall, several fine churches and recreation parks. Pop. 5,000.

METROPOLITAN, the Greek name of an archbishop, whose see is the chief place or metropolis of a province. The metropolitan is above the bishop, but below the patriarch. The title of patriarch, however, is in use only in the Eastern churches. In Russia the metropolitan is at the head of the hierarchy. In the Roman Catholic Church an archbishop may bear this title even though he does not have a metropolis as a see, thus the archbishop of Westminster is styled metropolitan.

METROPOLITAN MUSEUM OF ART. See ART, METROPOLITAN MUSEUM OF.

METTERNICH, mĕt'tĕr-nĭh, Clemens **Wenzel Nepomuk Lothar,** PRINCE, Austrian statesman; b. Coblenz, 15 May 1773; d. Vienna

11 June 1859. He was educated at Strassburg; when only 17 represented the Westphalian princes at the coronation of Leopold II; settled in Vienna in 1794; and assured himself a place in diplomacy by marrying the granddaughter of the Austrian chancellor, Kaunitz, in 1795. This marriage not only gave him entry to the best society, but brought wealth, and at the Congress of Rastatt he represented the Westphalian collegium, where he served his apprenticeship in politics. In 1801 he was sent to Dresden by Austria; two years later to Berlin; there a part of his mission was to cultivate the friendship of the French Ambassador. He did this so well that that official induced Napoleon to suggest to Austria that Metternich would be a most acceptable representative at the Tuileries; and so in 1806 he was sent to Paris, where he ingratiated himself with Caroline Murat, sister to Napoleon, and with Tallyrand. On the outbreak of the war between France and Austria, Metternich was put to much personal inconvenience by Napoleon, who forcibly detained him for some time. Thereafter he entered eagerly into the anti-Napoleonic league; assisted in the formation of the Quadruple Alliance; and as Germany proved successful, took no part in the national sentiment which arose, but directed himself solely to the aggrandizement of Austria, hence doing his best to preserve the French boundaries as they had been and to render Austria the only gainer among the powers by the reapportionment of Europe. He is credited with having planned and brought about the marriage of Napoleon and Maria Louise. In the years that followed he carried things his own way in Austria, planned the Holy Alliance and was extremely reactionary in his internal and foreign policies. In the difficult times of Napoleon's supremacy and his fall Metternich guided Austria policies with a masterly hand. As a diplomatist he was the equal of any of his time. In 1814 he visited England and formed the quadruple alliance. He was the master spirit at the Congress of Vienna and for 15 years thereafter was the leading statesman of Europe. The Revolution of 1830 in France showed the ill-success of his program; and the rising of 1848 and the insurrection in Vienna itself made it necessary for the Emperor Ferdinand to demand his resignation. He kept some power even then, his counsel being frequently sought. Consult Gross-Hoffinger, 'Fürst Metternich und das osterreichische Staatsystem' (1846); Mazade, 'Un chancelier d'ancien régime: le régne diplomatique de M. de Metternich' (1889); Malleson, 'Life of Prince Metternich' (1888); Demelitsch, 'Metternich und seine auswärtige Politik' (1898); Sandeman, J. A. C., 'Metternich, Life and Career' (New York 1911).

METZ, mĕts, Germany, an important fortified city and episcopal see of Alsace-Lorraine, on the Moselle, which here divides into several arms, 79 miles northwest of Strassburg. It is the third city of Alsace-Lorraine and has four representatives in the First Chamber of the Prussian Diet. The major part of the town stands on a height within the fortifications, outside of which there is a series of strong detached forts of excessive strength. Metz is also the centre or seat of control of the group of forts which includes Diedenhofen and Bitsch. In 1912 the garrison numbered 25,000. The cathedral is a late Gothic structure, surmounted by a spire of open work 397 feet high. There are imposing public buildings. The manufactures consist of woolens, cottons, hosiery, hats, muslin, glue, leather, etc. Several battles were fought in the neighborhood and under its walls between the Germans and French in August 1870. The Germans subsequently invested the town and, being reduced to a state of famine, on 28 October it capitulated with 180,000 officers and men under the command of Marshal Bazaine. The near-by cemetery of Chambiere holds the remains of over 7,000 French soldiers who perished here. It was included in the cession of territory to Germany at the Peace of 1871. Metz was anciently known as Divodurum, and later the Romans rechristened it Mediomatrica, of which Metz is a contraction. The Romans built military roads through the territory, and a fine aqueduct, of which traces remain. Attila sacked the town in the 5th century. After the retirement of the Huns, the Franks obtained control and made it the capital of Austrasia. In 870 it was included in East Francia, and developed under German influence. Its prosperity increased, and in the 13th century, as a free imperial city, it attained the zenith of its prosperity. It was taken by the French in 1553. This ownership was later confirmed by the Peace of Westphalia in 1648. Thereafter it remained until 1870, with the rest of Alsace-Lorraine, a peaceable French territory. For its history in 1870–71, see FRANCO-GERMAN WAR. Marshal Pétain entered the city at the head of the Tenth Army on 19 Nov. 1918 amid great rejoicing. After 47 years of German domination Metz was reunited to France. Pop. 68,598.

MEUDON, mè-dôn, France, a town southwest of Paris, near the Seine, on the railway to Versailles, six miles to the west. It had formerly a fine château, built by Louis XIV, surrounded by the Forêt de Meudon, still a favorite holiday resort of the Parisians. This château was fitted up in 1812 by Napoleon I for Marie Louise, and it was a residence of the Napoleons under the Second Empire, but was ruined during the siege of Paris in 1870. An astronomical observatory has since been established in the remains of the castle. The Duchess of Galliera established here a home for the aged and for orphans, at a cost of $2,800,000. Meudon has glass-works, bleach-fields, extensive government munition works and other industrial establishments. Rabelais was for a short time curé of Meudon. Pop. of commune about 12,292.

MEULEN, mē'lĕn, **Adam Frans van der,** Flemish painter: b. Brussels, 11 Jan. 1632; d. Paris, 15 Oct. 1690. He studied under Snayers; removed to Paris; and there became court painter to Louis XIV, for whom he painted many battle scenes.

MEUNIER, mē-nē-ā, **Constantin,** Belgian artist: b. Brussels, 1831; d. there, 4 April 1905. He is known as a historical and genre painter as well as a sculptor of considerable power, though his naturalistic pictures are sometimes revolting; and it would seem as if his studies in Madrid had brought him under the influence of Ribera and his sanguinary school. He has produced some vivid pictures of life in the colliery district amid whose unlovely surround-

ings he has made his home. His 'Martyrdom of Saint Stephen' in the Ghent Museum is quite in the spirit of Ribera and shocks the mind by its brutal literalness. 'The Peasants' Rebellion' is an example of his energy and force as a realist in modern life. His statue 'The Lost Son' is in the Berlin National Gallery.

MEUNIER, Étienne Stanislas, French geologist: b. Paris, 1843. A student of the Paris faculty of sciences, he attained his doctor's degree in 1869 and was laureate of the Academy of Sciences in 1878. In 1892 he was appointed professor of geology at the National Museum of Natural History. He was made a knight of the Legion of Honor, and has been vice-president of the Geological Society of France. His chief publications are 'Le ciel géologique' (1871); 'Géologie des environs de Paris' (1875; rev. ed. 1912); 'Geologie régionale de France' (1889); 'La géologie comperée (1895); 'Nos terrains: géologie populaire' (1898); 'La géologie générale' (1903); 'La géologie expérimentale' (1904); 'Les convulsions de l'écorce terrestre' (1910).

MEURICE, Francois Paul, frän-swä pōl mė-rēs, French dramatist: b. Paris, 1820; d. there, 11 Dec. 1905. He was educated at the Collége Charlemagne and entered upon a literary career. He worked for a time in collaboration with Dumas, with whom he made a translation of Hamlet, and was entrusted by Victor Hugo, his brother-in-law, with the publication of his complete works. He published 'Benvenuto Cellini' (1852); 'Fanfan la Tulipe' (1858); 'Cadio' (1868); 'Césara' (1869), etc.

MEURSIUS, mēr'sĭ-ŭs, Johannes Van Meurs, Dutch scholar and historian: b. Lovsduinen, 1579; d. 1639. Besides 'Glossarium Græco-Barbarum' (1614); and 'Athenæ Batavæ' (1625); for his edition of Greek authors he wrote numerous introductory essays which J. F. Gronovius reprinted in 'Thesaurus Antiquitatum Græcarum.' His complete works were edited by Lami (12 vols., Florence 1741–63).

MEUSE, mēz, or mūz, river which rises in France in the south of the department Haute-Marne, and with a northward trend crosses the northwestern corner of the department Vosges where between Bazielles and Noncourt it has a subterranean course of three and a half miles. It traverses the departments Meuse and Ardennes, and on reaching Sedan enters Belgium. At Namur where it receives on the left its largest tributary, the Sambre, almost doubling its volume, it changes its course to northeast, and passes Liège, where it is augmented by the Ourthe; it separates Dutch from Belgian Limburg, passing Maestricht and Roermond, at the latter of which it receives the Roer. In the northern part of Dutch Limburg its course is changed to northwest, and subsequently it becomes west. The whole of its after-course is through the Netherlands, in which it forms for some distance the boundary between North Brabant and Gelderland. It finally joins the left bank of the Waal, one of the arms of the Rhine, and gives its name to the accumulated flood of these streams, which, proceeding west through Holland proper, is divided near Dordrecht into two great rivers, the one of which bends round to the north and reaches Rotterdam; the other branch continues west; shortly after the two branches again unite and discharge themselves into the North Sea. The direct length of the Meuse is 230 miles; and its length including windings is 580 miles. It is navigable for about 460 miles. A section of the Meuse River was selected by the French government before 1870 as the location for a chain of protective forts which became known as the Meuse line. These forts extend for 31 miles from Verdun to Toul, being disposed along the eastern banks of the river. The names of the forts are Verdun, Saint Mihiel, Genicourt, Troyon, Lionville, Saint Agnant, Gironville, Jous sous les Cote and Tours. There was also constructed a second line of forts from Pagny to Neufchateau. This region saw some of the heaviest fighting of the Great World War. See WAR, EUROPEAN.

MEXCALA, mās-kä'lä, or **MESCALA** mĕs-kä'lä, a river of Mexico, in the southern part, which has its rise in the mountains southeast of the City of Mexico, and flows generally west for 450 miles to the Pacific. It is called Atoyac in the first part of its course, and is the boundary line between the states of Michoacàn and Guerrero, it is called Rio de las Balsas. The port of Zacatula is at its mouth. It is a swift-flowing stream, and has a number of low cascades and rapids.

MEXIA, Tex., city in Limestone County on the Houston and Texas Central and the Trinity and Brazos Valley railroads, 40 miles northeast of Waco. Natural gas and oil are produced nearby and cotton and corn are extensively cultivated. The city has a broom factory, cotton mills and oil mills, city hall, railroad repair shops, and a public library. The commission form of government is in operation. Pop. 2,690.

MEXICAN ARCHÆOLOGY. See MEXICO — ARCHÆOLOGY.

MEXICAN HAIRLESS DOG, a small terrier-like dog, of uncertain origin, without hair except a tuft on the crown of the head, another on the tail and a few scattering wisps on the body; the skin is grayish black, wrinkled and dry. Clavigero describes a large hairless dog found among the Mexicans by the Spanish conquerors, whose puppies were esteemed as an edible delicacy; and others are recorded as having occurred in ancient Peru and on various of the West Indian islands.

MEXICAN JUMPING BEAN. See JUMPING BEANS.

MEXICAN LITERATURE. See MEXICO — LITERATURE.

MEXICAN NUN, The, name given to JUANA INEZ DE LA CRUZ, Mexican poet: b. San Miguel de Nepantla, near Mexico, 12 Nov. 1651; d. Mexico, 17 April 1695. She was well known in Mexico for her learning, took the veil in the convent of San Jerónimo, after some years abandoned her studies wholly for the duties of the convent, and sold her library in aid of charity. Her death occurred during a severe epidemic. Among her works are 'Poésias Sagrades y Profanas'; 'El Neptuno Alegórico', and the comedy 'Los Empeños de Una Casa.'

MEXICAN ONYX, a stained and banded

variety of Calcite. It is not true onyx. See CALCITE; ONYX.

MEXICAN SUBREGION, a faunal district of the Neotropical region embracing the low hot coast region of Mexico. See ZOOGEOGRAPHY.

MEXICAN TEA. See GOOSEFOOT.

MEXICAN WAR, The. The annexation of Texas in 1845 laid the foundation for the war with Mexico. Although Texas had been for many years practically free, and had been recognized by the United States, England, France and other countries, yet Mexico still refused to acknowledge its independence. When therefore the United States proposed to admit Texas into the Union, Mexico gave warning that the annexation would be equivalent to a declaration of war, and 6 March 1845 protested, and soon afterward withdrew her Minister and severed diplomatic relations. Her acts, however, scarcely justified her threats, as at that time at least little or no preparation was made for war. It has, therefore, been claimed that had the American government used a conciliatory policy peace might have been preserved, and friendly relations re-established.

At the moment, however, the Mexican people and authorities were in a rather belligerent attitude, due in part to pride, and in part to an expectation that the United States would soon be involved in a war with Great Britain over the Oregon boundary, in which case Mexico would have a powerful ally to aid her. Did President Polk at this point seek to strengthen this hope in the minds of the Mexicans, intending at the proper moment to make a compromise and peace with England, as was done, and thus leave Mexico at the mercy of the United States? Perhaps history can never answer the question, but events at least seemed to march in harmony with the thought. For Mexico soon found herself in the dilemma that she must either sell California to the United States, receiving in return a goodly sum of money to appease her pride, or engage in a war to sustain her honor and territorial integrity. Mexico bravely, but perhaps not wisely, chose the latter alternative, not fully realizing the inequality of the contestants, nor the depth of the humiliation to which she would be subjected. Doubtless President Polk preferred to acquire California without war; but its acquisition was to be the principal measure of his administration. Hence if war was the only means to secure it, war it must be; at least enough to get possession of the desired territory.

Causes of the War.— The immediate occasion, however, of the war was the dispute in regard to the western boundary of Texas. Proclaiming her independence in 1836 Texas asserted that her western boundary was the Rio Grande to its source, thence due north to the 42d degree of north latitude. The following year the United States recognized her independence, and in December 1845, by a joint resolution, admitted her into the Union as a State, providing that boundary disputes were to be settled by the United States. President Polk accepted the boundary line claimed by Texas, and 13 Jan. 1846 ordered Gen. Zachary Taylor to march to the eastern bank of the Rio Grande as the western boundary of the United States. Mexico insisted that the Nueces River — 100 miles eastward — was the true western boundary of Texas, and therefore that General Taylor was now on Mexican soil. On 25 April 1846, the first blood was shed in a conflict between a band of Mexican troops that had crossed to the eastern side of the Rio Grande and a company of American soldiers. The news of this action was immediately communicated by General Taylor to President Polk, who sent his now noted message to Congress, asserting that war was begun by the act of Mexico on American soil. Congress accepted, after a stormy debate in the Senate, the President's statement, and war was recognized as existing.

Other causes than the two already noted were also at work, and help to make a decision in regard to the justness of the war still more difficult. Mexico for many years had been in a chronic state of revolution. The natural result followed. American citizens in Mexico sustained property losses and doubtless were frequently unjustly arrested and even imprisoned. Claims arising from these causes had been in part settled under a convention of 1840; but many of them were still pending. Some were just; more, either unjust or extravagant in amount. President Polk united these unsettled claims with the boundary question, and demanded that Mexico receive an envoy extraordinary with power to settle both — on its face an eminently fair proposition. On the other hand, Mexico professed to be ready to receive an ambassador to settle the boundary dispute, but declined to receive Mr. Slidell as our minister when commissioned to settle all disputes, insisting that the two questions were distinct in kind and origin and should not be united. President Polk in his message asserted that this action of Mexico was in violation of her promise to receive a minister, and hence justified his administration in its measures, and forced him to take possession of the disputed territory.

The need of more slave territory was perhaps another factor in causing the war. At least many from the South took an aggressive position on all questions in dispute between the two countries and thus made a peaceable settlement more difficult. Both the economic and the political reasons for more territory began to be felt by 1846 — the one to have new soil over which to spread the land-exhausting system of slavery; and the other to have new territory out of which to carve new slave States that the equilibrium between slave and free States might be maintained. Some other forces tending to arouse the war and aggressive spirit may be noted. The cry of "manifest destiny" played a part. Many, especially in the West, felt that the Pacific Ocean was the natural western boundary of the United States. They also demanded the "Golden Gate" that commerce might be opened up with the Orient. The two great parties — the Whigs and the Democrats — divided quite sharply on the question; in fact so completely that the war became almost a party, instead of a national, issue. The Democrats, as a rule, supported the administration and its claim that the war was just. The Whigs, on the contrary, asserted that it was a most unholy and unrighteous war, and characterized it as Polk's war. Lincoln, entering Congress in 1847, became a severe critic of the

policy pursued, while Tom Corwin of Ohio went so far as to use this language: "If I were a Mexican I would tell you, 'Have you not room in your own country to bury your dead men? If you come into mine we will greet you with bloody hands, and welcome you to hospitable graves.'"

President Polk summarized his reasons for recommending that Congress recognize war as existing as follows: "The grievous wrongs perpetrated by Mexico upon our citizens throughout a long period of years remain unredressed; and solemn treaties . . . have been disregarded. . . . Our commerce with Mexico has been almost annihilated." He then adds: "As war exists, and . . . exists by the act of Mexico herself, we are called upon, by every consideration of duty and patriotism, to vindicate, with decision the honor, the rights, and the interests of our country."

The Campaigns.—The war with Mexico was accepted as a fact by Congress 13 May 1846. There were four principal fields of action in its prosecution. (1) Along the Rio Grande, under the command of Gen. Zachary Taylor; (2) in California, where Capt. John C. Frémont and Admiral Stockton were in command; (3) in New Mexico, with Gen. Stephen W. Kearney leading the American forces; and (4) from Vera Cruz to the City of Mexico, under the command of Gen. Winfield S. Scott, the commander-in-chief of the American armies. Everywhere success attended the American arms. Perhaps it was the first war in history, lasting two years, in which no defeat was sustained by one party, and no victory won by the other.

General Taylor defeated the Mexican troops at Palo Alto 8 May; at Resaca de la Palma the following day and captured Matamoras on the 18th. He remained near that city for some weeks to recruit his army and prepare to advance into the interior. On 24 September he entered Monterey, after a siege of four days, and a gallant resistance by the Mexicans. Taylor's most famous victory, however, was won 23 Feb. 1847, at Beuna Vista. General Scott gave orders, which unfortunately fell into the hands of Santa Anna, the Mexican general, for General Taylor to send some nine regiments to aid Scott in his proposed attack on Vera Cruz. Santa Anna immediately marched his whole command against Taylor, expecting to crush him in this weakened condition. It was 20,000 men against about 5,000. But the skill of Taylor, the persistence of his army, the organization and equipment of the American troops, won a great victory. Taylor became the hero of the hour, and Buena Vista made him an irresistible Presidential candidate.

Frémont's course in California has been a subject of keen controversy. As leader of an exploring expedition he was already in northern California, and early in 1846 was recalled to the Sacramento Valley. California was the goal of the political policy of Polk's administration. The means to secure its acquisition were uncertain. It might be gained by war; or by filling the territory with American settlers who in course of time might bring it into the Union as Texas had already been annexed; or it might be effected by securing the goodwill of the native Californians who were already jealous of Mexican rule. The latter policy seems to have been the one adopted by the administration. The American consul at Monterey, Mr. Larkin, was developing this policy with a good prospect of success, it is claimed, when Frémont appeared on the scene. He seems to have developed a fourth policy, namely, the establishment of an independent government under the control of the American settlers in the Sacramento Valley. This movement resulted in the "Bear Flag Republic," and virtual civil war between the native Californians and the American settlers. At this moment the Mexican War began and the "Bear Flag" was replaced by the "Stars and Stripes." It has been claimed by some California historians that Frémont's course, had not the Mexican War come at the moment it did, might have lost California to the United States. The native Californians, alienated as they were by his course, might have put themselves under an English protectorate in revenge for the treatment accorded them. Be this as it may, by the end of the year all California was conquered and held by American troops, and Frémont was regarded as the hero who had won the "Golden Gate" by his energy and decision. Santa Fé was captured by General Kearney, and New Mexico secured with almost no loss of life. By the end of the year, therefore, all the territory that the administration desired was in the possession of its armies, but Mexico was still unconquered.

Scott had been chafing in Washington during the summer and fall of 1846 while Taylor was winning his brilliant victories. He asked to go to the front to assume chief command, but the administration retained him at the capital under the plea of needing his advice. As it happened this Democratic war was officered by Whig generals. Scott had already been a Whig candidate for President. The charge was now made that Scott was kept from command for fear that success might make him a more formidable candidate in 1848. Finally, when he was sent to the front in January 1847, the cry was raised that the purpose was to dim the lustre of Taylor's victories, or at least to divide the popular support between the two generals in such a way as to destroy the political prospects of both.

General Scott invested Vera Cruz in March 1847, and by the 27th had captured the fortress which had been thought to be almost impregnable, and was ready to enter the city. On 8 April he started into the interior, and on the 18th captured Cerro Gordo; the 19th, Jalapa, and the 22d Perote. On 15 May he entered the important city of Puebla. Remaining here for some weeks he again advanced, in August, toward the capital, and on the 10th came in sight of the city of the Montezumas. Two important victories were won 20 August—at Contreras and at Churubusco. He captured Molina del Rey 8 September, and five days later the victory of Chapultepec gave him the City of Mexico itself which he entered on the following day with an army of only 6,000 men. The war was practically over, but the victory was so complete that it began to be a question whether there was any government left with sufficient power to negotiate a treaty of peace. An agitation began with friends both in and out of Congress, as well as in the cabinet, looking to the annexation of the whole of Mexico

Calhoun on the one hand, Webster and a majority of the Whigs on the other, joined hands to defeat this plan. President Polk was finally forced to make the ultimate decision. N. P. Trist was sent in March 1847 to Mexico to make a treaty of peace. Failing he was ordered in the fall to return to Washington; but disobeying instructions he remained in Mexico, and on 2 Feb. 1848 concluded a treaty of peace in harmony with his original instructions. The administration was in a quandary. To ratify meant to condone the disobedience of Trist. To reject meant a prolongation of the war, and time to perfect the intrigue for the annexation of "All Mexico." President Polk, after some hesitation, decided to send the treaty to the Senate for its consideration. Received 23 February, it was ratified, after some amendments, 10 March, by a vote of 38 to 14. On 30 May ratifications were exchanged and the war was at an end.

The Mexicans had fought bravely, even stubbornly and at times skilfully, yet in every contest, even when the odds were greatly in their favor, without a single victory. In part superior leadership and training won for the soldiers of the northern republic; in part their cooler and more persistent character; but in the main it was not bravery, nor generalship, nor even character that won. It was science and education applied in the equipment of the armies, the guns of the soldiers, the cannon on the ramparts and the powder in the arsenals which made the one so much more effective than the other that the most daring bravery was no counterpoise.

The Treaty of Peace.— The treaty of Guadalupe Hidalgo gave to the administration of President Polk the territory that his diary informs us he intended to acquire, California and New Mexico. Mexico in return for the loss of its fairest northern provinces was paid $15,000,000, and released from all claims of all kinds held by citizens of the United States against her, estimated at $3,250,000, which the United States assumed. Boundary lines were drawn, and provision made in regard to other questions at issue between the two countries.

Results.— Usually successfully waged wars redound to the credit of the party in power. In this case, however, the Democratic party, the author and supporter of the war, was defeated by the Whig party, the party of opposition and criticism, in the Presidential election of 1848. The Whigs made use of the popularity of a successful general to defeat the party that had made his glory possible. Evidently the American people were ready to accept the fruits of the war, but also ready to punish the party they believed had wrought in a wrong manner. A large number of young officers, destined to renown in later years proved their worth in this war. U. S. Grant and Wm. T. Sherman, Robt. E. Lee, "Stonewall" Jackson and Jefferson Davis, in the great Civil War, foreshadowed, in this Mexican struggle, the greatness that was to be theirs in the "days that tried men's souls" from 1861 to 1865. The acquisition of 522,568 square miles of territory — an empire four times as large as Great Britain, was the most important immediate as well as remote result. It was important in the issues that its acquisition precipitated. Should it be slave or free territory? Who should determine its institutions? Out of this question grew the larger one, who had the right to control the institutions of the territories in general? To settle the first question David Wilmot, a Democrat of Pennsylvania, proposed the celebrated "Wilmot Proviso" (q.v.) which would exclude slavery forever from all territory acquired from Mexico. Four long years of intense and bitter debate followed. This question and a series of others were settled temporarily in the Compromise of 1850. The second question was answered by the phrase "Non-intervention," which meant, or soon came to mean, one thing to Douglas and the Northern Democrats, and another to Davis and the South. Three main theories were evolved or defended in answer to the third query. (1) That Congress had the right to control the institutions of the Territories and could make them slave or free at its will. (2) The Dickinson-Cass-Douglas doctrine of Popular or "Squatter" sovereignty:— the doctrine that the people of a territory themselves, while yet in a territorial status, determined their own institutions. (3) The radical Southern view that slaves were property, and, as property might be taken into any Territory,— the common public domain of the States, — with no constitutional power anywhere to hinder or prevent. It was important secondly in its industrial and political effect on the nation. The United States now had an outlook on the Pacific Ocean comparable to that on the Atlantic. China, Japan and the East were brought within the circle of its influence. Conditions favorable to further expansion were prepared. In addition to the great effect on commerce thus prefigured, that on wealth and industry was not less. The gold, silver, copper and other mineral wealth of the Rocky Mountain region was turned into the pockets of the American people. This vast addition of territory and wealth tended also to emphasize national pride and ambition; to arouse a still more intense belief in "manifest destiny"; to develop a more optimistic tone, and perhaps also to produce a more materialistic spirit.

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MEXICO (Sp. *Méjico*, officially *República Mexicana* and *Estados Unidos Mexicanos*), the southernmost country of North America and a federal republic, situated between 14° 30′ 42″ and 32° 42′ north latitude, and between 86° 46′ 8″ and 117° 7′ 31″ longitude west of the meridian of Greenwich. Its name is closely allied with the group of tribes who called themselves *Mexica* or *Azteca*. The name is derived from the tribal war-god, Mexitl, also called Huitzilopochtli. The Spaniards gave the name Mexico to all the countries in which they found the Aztecs supreme at the time of the Conquest. Mexico is one of the most interesting of the countries of the Western Hemisphere, because of its aboriginal civilization and social customs, many of which have persisted to our own day. It is also of importance because of its great natural resources, which now bid fair to be utilized for the benefit of her children instead of the predatory foreigner. These topics, together with the geography, art, architecture, literary history, commercial life and political history, are here treated under the following heads:

1. Area, Boundaries, etc.
2. Minerals and Mineral Production.
3. Agriculture and Stock-raising.
4. Commerce.
5. Manufactures.
6. Transportation and Communication.
7. Banking and Finance.
8. Government.
9. Army and Navy.
10. Education.
11. Religion.
12. Mythology.
13. Art.
14. Architecture.
15. Ethnology.
16. Literature.
17. History.
18. Diplomatic Relations of the United States with.

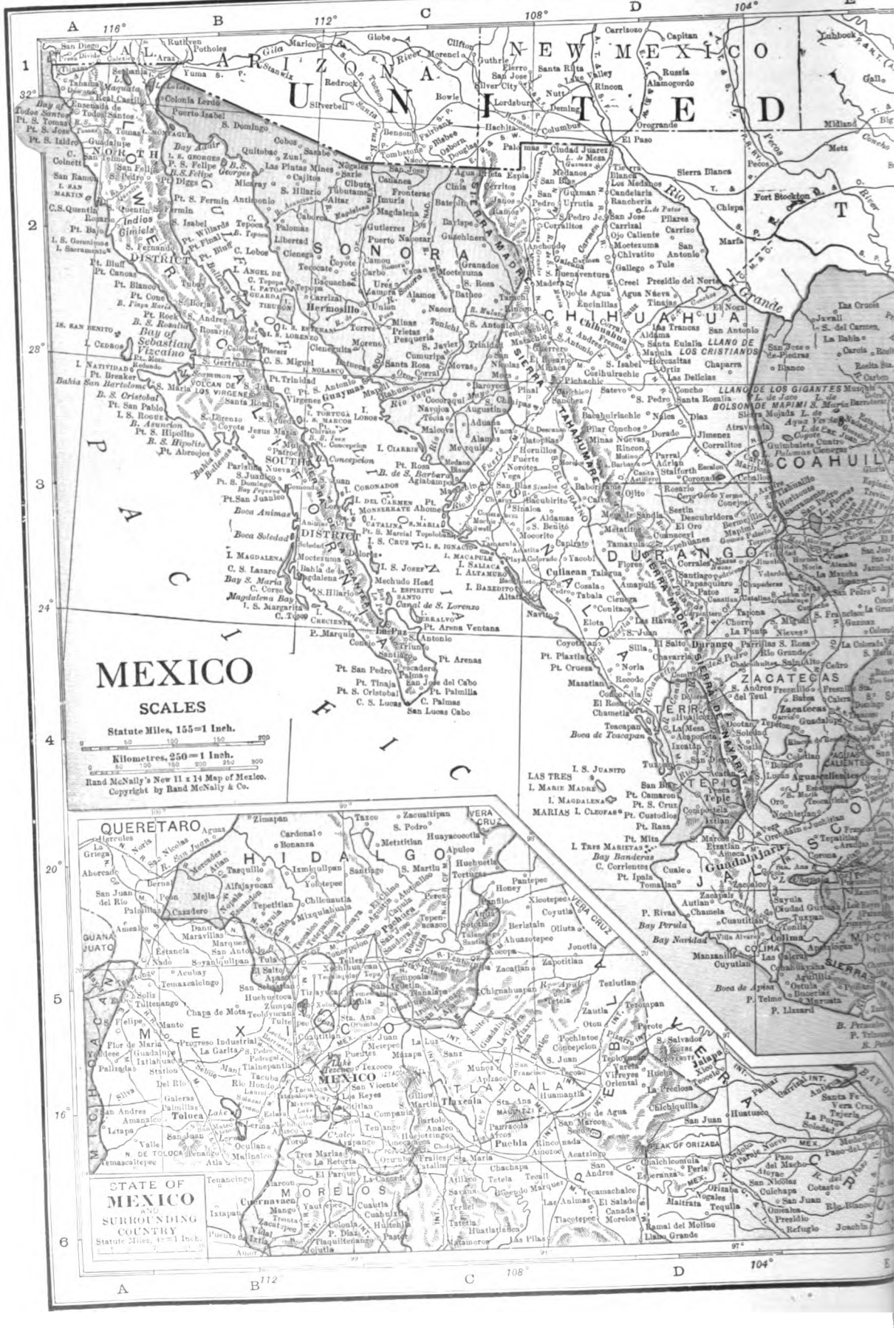
1. AREA, BOUNDARIES, ETC. Mexico's total area is 767,326 square miles, and its boundaries are the United States on the north, Guatemala and Belize on the southeast, the Pacific Ocean on the south and west, and the Gulf of Mexico and the Caribbean Sea on the east. Its coast line on the east is 1,772 miles in length and on the west or Pacific side, 4,594 miles. The northern or United States boundary was fixed by treaty 2 Feb. 1848 and 30 Dec. 1853, and extends from the mouth of the Rio Grande, on the Gulf of Mexico, following that river a distance of 1,136 miles, beyond El Paso, Texas; thence to a point on the Pacific Ocean, one marine league due south of the southernmost point on the Bay of San Diego. The total length of the northern boundary line is 1,833 miles. The Guatemalan boundary line was fixed by treaty 27 Sept. 1883 and 1 April 1895; and the Belize line by treaty signed 8 July 1893 and ratified 19 April 1897. The length of the southern boundary of Mexico is 642 miles.

By the treaty of Guadalupe-Hidalgo, ratified 2 Feb. 1848, and the Gadsden treaty of 30 Dec. 1853, Mexico ceded to the United States 930,590 square miles of her territory, or 163,264 more than half. The first-named treaty involved 362,487 square miles of domain, now part and parcel of the United States, as follows: Texas, 265,780 square miles; Colorado (in part), 18,000; Kansas (in part), 7,766; New Mexico, 65,201; Oklahoma, 5,740. Under the terms of the second or Gadsden treaty the United States acquired 522,568 square miles, which are now held as follows: Arizona, 82,381; California, 157,801; Colorado (in part), 29,500; Nevada, 112,090; New Mexico, 42,000; Utah, 84,476; Wyoming (in part), 14,320. By virtue of the same treaty a later addition was ceded, consisting of 31,535 square miles to Arizona and 14,000 to New Mexico.

Political Divisions and Population.— Mexico is divided politically into 27 states, three territories and a federal district. These with their areas and populations, capitals and populations, are as follows:

STATES AND TERRITORIES	Area (in square miles)	Population	Capital	Population
Aguascalientes	2,950	120,511	Aguascalientes	45,190
Baja California*	58,328	52,272	N. District, Ensenada	2,170
			S. District, La Paz	5,556
Campeche	18,087	86,661	Campeche	16,775
Chiapas	27,222	438,843	Tuxtla Gutiérrez	10,256
Chihuahua	87,802	405,707	Chihuahua	39,706
Coahuila	63,569	362,092	Saltillo	35,414
Colima	2,272	77,704	Colima	25,149
Durango	38,009	483,175	Durango	32,263
Federal District	463	720,753	Mexico City	471,066
Guanajuato	11,370	1,081,651	Guanajuato	35,663
Guerrero	24,996	594,278	Chilpanzingo	7,000
Hidalgo	8,917	646,551	Pachuca	39,000
Jalisco	31,846	1,208,855	Guadalajara	119,444
Mexico	9,247	989,510	Toluca	31,247
Michoacán	22,874	991,880	Morelia	40,042
Morelos	2,773	175,594	Guernavaca	12,775
Nayarit	11,275	171,173	Tepic	16,778
Neuvo Leon	23,592	365,150	Monterrey	73,529
Oaxaca	35,382	1,040,398	Oaxaca	38,000
Puebla	12,204	1,101,600	Puebla	96,120
Queretaro	3,556	244,663	Querétaro	33,000
Quintana Roo*	18,886	9,109	Santa Cruz de Bravo	2,000
San Luis Potosi	25,316	627,800	San Luís Potosí	68,000
Sinaloa	33,671	323,642	Culiacán	13,557
Sonora	76,900	265,383	Hermosillo	14,500
Tabasco	10,072	187,574	San Juan Bautista	12,000
Tamaulipas	32,128	249,641	Ciudad Victoria	12,000
Tlaxcala	1,595	184,171	Tlaxcala	2,000
Vera Cruz	29,201	1,132,859	Xalapa	24,000
Yucatán	35,203	339,613	Mérida	62,000
Zacatecas	24,757	477,556	Zacatecas	25,000
Islands	1,560	.....	.....	.....
Total	767,055	15,112,608		

*Territories


MEXICO
SCALES
Statute Miles, 155=1 Inch.
Kilometres, 250=1 Inch.
Rand McNally's New 11 x 14 Map of Mexico.
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STATE OF MEXICO AND SURROUNDING COUNTRY
Statute Miles, 45=1 Inch.
UNITED STATES
NEW MEXICO
ARIZONA
SONORA
CHIHUAHUA
COAHUILA
DURANGO
ZACATECAS
NUEVO LEON
TAMAULIPAS
SAN LUIS POTOSI
AGUASCALIENTES
JALISCO
COLIMA
TEPIC
NAYARIT
SINALOA
LOWER CALIFORNIA
NORTH WESTERN DISTRICT
SOUTH WESTERN DISTRICT
PACIFIC OCEAN
GULF OF MEXICO
QUERETARO
HIDALGO
MEXICO
TLAXCALA
MORELOS
VERA CRUZ
PUEBLA
MICHOACAN
GUANAJUATO
Rio Grande
Rio Bravo
Gila
Colorado
Pecos
Sierra Madre Occidental
Sierra Madre Oriental
Sierra Madre del Sur
Sierra Nevada
Sierra Blanca
Sierra Mojada
Llano de los Gigantes
Llano de los Cristianos
Bolson de Mapimi
Peak of Orizaba
Volcan de Colima
Volcan de Popocatepetl
Volcan de Toluca
Volcan de Jorullo
Bay of Sebastian Vizcaino
Gulf of California
Bay of Todos Santos
Bay Banderas
Bay Perula
Bay Navidad
Boca de Tascapan
Boca de Apiza
Magdalena Bay
Bay S. Maria
Bay of Conception
Bay of Espiritu Santo
Canal de S. Lorenzo
Bahia San Bartolome
Bahia de la Magdalena
Boca Soledad
Boca Animas
Bay Pescadero
Bay of Ascension
Bay of Asuncion
Bay of Magdalena
Bay of Santa Maria
Bay of Guaymas
Bay of Kino
Bay of Adair
Bay of Cortez
Bay of Concepcion
Bay of Todos Santos
Bay of Ensenada de Todos Santos
Bay of Colonia Lerdo
Bay of Puerto Isabel
Bay of Bay Amir
Bay of Bay Georges
Bay of Bay Felipe
Bay of Bay Quintabe
Bay of Bay Zuni
Bay of Bay Sandia
Bay of Bay Antonio
Bay of Bay Quentin
Bay of Bay Fermin
Bay of Bay Isabel
Bay of Bay Willards
Bay of Bay Tepoca
Bay of Bay Lobos
Bay of Bay Libertad
Bay of Bay Cenega
Bay of Bay Tecoate
Bay of Bay Angel de
Bay of Bay Tepopa
Bay of Bay Dacuachee
Bay of Bay Carrizal
Bay of Bay Hermosillo
Bay of Bay Torres
Bay of Bay Tastiota
Bay of Bay Pinacate
Bay of Bay Pinacate
Bay of Bay Pinacate

STATES
TEXAS
ARKANSAS
LOUISIANA
MISSISSIPPI
ALABAMA
FLA
Fort Worth
Dallas
Austin
Houston
Galveston
New Orleans
Mobile
Pensacola
Montgomery
Monterrey
TAMAULIPAS
Victoria
Tampico
HIDALGO
MEXICO
MEXICO
MORELOS
Puebla
Tlaxcala
Cuernavaca
Chilpanzingo
OAXACA
Oaxaca
TABASCO
San Juan Bautista
CHIAPAS
Tuxtla
Campeche
CAMPECHE
TERRITORY
QUINTANA ROO
Merida
YUCATAN
BRITISH HONDURAS
BELIZE
CENTRAL AMERICA
GUATEMALA
HONDURAS
SALVADOR
GULF OF MEXICO
BAY OF CAMPECHE
GULF OF TEHUANTEPEC
GULF OF HONDURAS
OCEAN
Rio Grande
Longitude West from Greenwich
100°
96°
92°
88°
F
G
H
I
317B

Population.— The official statement of the Mexican government that the population of the country had increased to 8,743,014 in 1869, to 10,791,685 in 1886, to 13,607,259 in 1900 and to 15,063,207 in 1910, does not necessarily mean that the population had increased at the rate this increase in the census enumeration would seem to indicate, but rather that the gradual pacification of the country under the Diaz administration, the extension far and wide throughout the land of the administrative arms of the government, and a certain decrease in illiteracy had made the work of the census taker more effective. A prominent official connected with the census department in Mexico City expressed it as his opinion, in the presence of the writer, in 1910, that the actual population of Mexico was at that date nearer 20,000,000 than 15,000,000. Fundamentally the population of Mexico is Indian and mestizo (a mixture of Indian and European). (See MEXICO — ETHNOLOGY). The official census of 1910 showed about 20 per cent white population; but it must be remembered that a large percentage of the so-called whites have a certain amount of Indian blood in their veins; in fact there are very few of the older families that have not come under this influence. All children born of Mexican parents, whether in Mexico or in a foreign land, are, in the eyes of the law, Mexican citizens; and foreigners may become Mexican citizens by naturalization by making application to the department of foreign relations, provided they have resided five years in the country.

Topography.— In length of coast line the peninsula of Lower California leads with 1,864 miles, Yucatán following with 615, Sonora 524, Sinaloa 317, Vera Cruz and Guerrero 286 each, Oaxaca 255, Tamaulipas 249, Campeche 224, Chiapas 137, Tabasco 119, Colima 99 and Michoacán 81. The greatest length of the republic is from northwest to southeast, 1,942 miles; and the greatest width, east and west, is from the mouth of the Rio Grande to the United States' western boundary, 1,833 miles; and the narrowest is from the bar at Coatzacoalcos (Puerto Mexico), on the Atlantic side, to San Francisco del Mar, on the Pacific, 134 miles. Mexico, California and Tehuantepec are the principal gulfs on the Mexican coast, the first named being the largest in the world. In the commercial development of this continent they have performed and still perform a most important part. Mexico's great mass is the lofty Rocky Mountain plateau, which fills it almost from ocean to ocean, leaving but a narrow strip of coast. Entering from Guatemala (where a spur connects with the limestone and coral tableland of Yucatán), the system trends west, forming a tableland 150 miles wide at Oaxaca, with a steep descent and slender coast on the Pacific, but a more gradual one by terraces to the Gulf of Mexico in Tabasco and Vera Cruz. This spreads out and stretches northward to the vast plateau of Anahuac, 4,000 to 8,000 feet high, where the oceanic relations are reversed, the Atlantic side being precipitous and the Pacific terraced. There is no single range corresponding to the Andes or Northern Rockies. The so-called *cordilleras* are merely the outer escarpments of the plateau, though often far above its mean level. Loftiest of these is the Sierra Madre of the Pacific, traceable at a mean elevation of over 10,000 feet from Oaxaca to the United States. It skirts the western coast within from 60 to 70 miles of the entrance to the Gulf of California. Thence onward a far wider coast land has silted up. Along the Gulf of Mexico are the correspondent cordilleras of Tamaulipas and Nuevo Leon, 6,000 feet in mean elevation. The southern central plateau maintains its height of 7,000 to 8,000 feet with great persistency to within 40 miles or less of the Atlantic. Through Lower California is a similar ridge some 3,000 feet high. The plateau is not a level surface. Railroad elevation north from the capital varies by 4,500 feet, declining northward; while the centre is intersected by short secondary ridges and valleys, mostly with the north-northwest trend. Most important of these is the Anahuac cordillera, surrounding the valleys of Mexico and Puebla; its culminating point is the Nevado de Toluca ("snow peak"), 15,163 feet. But across this, and generally confounded with it, is a newer transverse ridge from ocean to ocean, traced by five active or recently quiescent volcanoes and several extinct cones, among which are Popocatépetl, 17,882 feet, and Ixtaccíhuatl, 17,338 feet, in the centre, southeast of Mexico City, and Orizaba, eastward bordering Vera Cruz state, 18,696 feet. On the Pacific side is Colima (volcano), 12,989 feet; and the line runs out to the Revillagigedo volcanic islands. The sierras of Guerrero, Oaxaca and Chiapas are nearly parallel to this. The other high mountain peaks of the republic are the Malinche, between the state of Tlaxcala and Puebla, 14,643 feet; the Coffre de Perote, Vera Cruz, 14,042; Ajusco, in the southern part of the Valley of Mexico, 13,075; Tancitaro, 12,661, and Petamban, 12,300, in Michoacán; Derrumbadas, 11,801, Ocelazin, 11,480, and Peñal, 10,744, in Puebla; Cempoaltepec, 11,139, Oaxaca; Lanitos, 11,021, Guanjuato; Tzirate, 11,022, Michoacán; Zumate, 10,994, and Navajas, 10,289, Hidalgo; and Laurel, 10,138, Aguascalientes. The mountains of Mexico are exceptionally picturesque and interesting, affording innumerable views beautiful in the extreme.

Rivers.— Mexico possesses comparatively few rivers, and of these few are large and deep enough to be of commercial importance. Many of those marked on the map of the republic are either wholly or practically dry a part of each year. This is especially true of the northern half of the country. The most important rivers are the Rio Grande (Bravo del Norte), which forms the northern boundary line of the republic for 1,097 miles; the Pánuco, which rises in the mountains of the state of Mexico and empties into the Gulf of Mexico at Tampico, after a course of 360 miles; the Papaloapan, the source of which is in the mountains of Oaxaca and which crosses the state of Vera Cruz, emptying into the Gulf of Mexico at Alvarado; the Coatzacoalcos, which also has its source in the state of Oaxaca, and crosses the state of Vera Cruz, emptying into the gulf at Coatzacoalcos, its length being 186 miles; the Grijalva, which rises in Guatemala and crosses the states of Chiapas and Tabasco, to the Gulf of Mexico, 327 miles away from its source; the Usumacinta, which also has its source in Guatemala, crossing the Mexican state of Tabasco

and emptying into the gulf a short distance south of Frontera, its length being 450 miles. Official reports state this to be "the most navigable river in Mexico."

The Tuxpan River, which has its source in the state of Hidalgo, crosses Puebla and Vera Cruz and empties into the gulf at Tuxpan. It is navigable for small boats. The Lerma, 457 miles in length, which rises in the mountains of Tenango, in the state of Mexico, crosses Jalisco and Tepic and empties into the Pacific at San Blas. The Balsas, 428 miles long, the source of which is in Puebla and which crosses Mexico, Morelos, Guerrero and Michoacán, empties into the Pacific at Zacatula, in the latter state. The Yaqui, 391 miles long, which rises in the Tarahumari Mountains, in the state of Sonora, empties into the Gulf of California a short distance below Guaymas. The Fuerte, 335 miles long, which rises in the state of Chihuahua, crosses the state of Sinaloa and empties into the Gulf of California. Other rivers are the San Pedro, 298 miles; Nazas, 279; Ures, 260, and Sinaloa, 260.

Lakes and Lagoons.— The principal lakes of Mexico, none of which are large, are Chapala, in Jalisco, a beautiful body of water some 51 miles long and 18 miles wide, the shores of which have become a favorite summer resort for wealthy residents of Mexico City, Guadalajara and other parts of the republic; Pátzcuaro (in Michoacán), around which there clusters a wealth of historic, artistic and poetic interest; Cuitzeo, in the same state; Chalco, Xochimilco and Texcoco, in the Federal District and state of Mexico; Tepancuapan, in Chiapas; Tequesquitongo, Coatelolco and Hueyapan, in Morelos; Catemaco, in Vera Cruz; Caivel and Carpintero, in Tamaulipas; Encantado, in Tabasco; Bacular, in Yucatán; and Uriria, in Guanajuato. The principal lagoons are the Terminos, in Jalisco and Michoacán; Tamiahua, in Vera Cruz; Madre in Tamaulipas; Mezcaltitlan, in Tepic; Coyutlán, in Colima; Tecpan and Coyuya, in Guerrero; Superior and Inferior in Oaxaca; Paras, Coyote and Agua Verde, in Coahuila; Guzmán, Jaco, Patos and Santa María in Chihuahua; Xaltocán, San Christóbal, Zumpango and Lerma in the state of Mexico; Meztitlán and Apan, in Hidalgo, and Santa Ana, in Tabasco. There are numerous other smaller lakes and lagoons in the republic, which are of much local importance, but which do not appear on the ordinary maps.

Valleys.— The principal valleys of the republic are those of Toluca, Mexico, Cuernavaca, Puebla, Oaxaca, San Francisco and Orizaba, all of which are extremely rich in soil and most favorably situated as to climate and other conditions affecting their products, which include very nearly every article grown in other parts of the American continent.

Climate.— The chief natural glory of Mexico is its climate, which, though not as invigorating as that of some other countries, is one of the most delightful in the world. In few localities is there ever intense cold or intolerable heat. It is seldom that death results from freezing, and sunstroke is practically unknown. In the tierra caliente or hot country, the temperature varies from 77° to 82° Fahr., in the shade, while on the central plateau, which includes the capital city, it is much cooler in summer and warmer in winter than in the United States. In Mexico City the maximum summer temperature in the shade is 85°, and winter temperature 72°; in Puebla, 84° and 75°; in Oaxaca, 94° and 83°; in Jalapa, 89° and 87°; in Querétaro, 90° and 80°; in Guanajuato, 91° and 82°; in Pachuca, 80° and 77°; in Saltillo, °89 and 76°; in Mérida, 103° and 92°; in Mazatlán 91° and 84°. The average night temperature in Mexico City from June to October is about 55°. The warmest months of the year in that city are April and May, the last two months preceding the beginning of the rainy season, which there extends from June to November. In the regions near the gulfs and the Pacific Ocean, the rains are much heavier and more frequent, and begin earlier and end later. The average rainfall on the coasts is 44 inches and on the table-lands 24 inches. In Mexico there are but two seasons — the rainy, or summer, and the dry, or winter. The temperatures of the spring and autumn months differ very slightly, and the seasons merge into each other quite imperceptibly. The nights are always cool, except in the hot country, where they are seldom uncomfortable, the gulf and Pacific breezes compensating for the heat of the day. There are no radical or sudden changes of temperature; no prolonged term of heat or cold or storm; and on the table-lands all seasons are so nearly alike that most persons wear clothing of the same weight all the year. Except in the northern states, artificial heat is seldom provided, either in homes or places of business, even in mid-winter.

In few other countries is to be found such diversity of climate as in Mexico, whose west coast extends across 18 parallels of latitude, and where the altitudes of the towns and cities range all the way from 26 feet above the sea at Vera Cruz, to 8,760 at Toluca, each plateau or step in the ascent illustrating in its fruits, foliage and flowers the influence of every climatic phase and condition. The white peaks of Orizaba, Popocatepetl and Ixtaccíhuatl look down upon a broad panorama of indescribable beauty to be seen only in this land of perpetual spring. The summer rains on the upper plateaus intensify the green of the verdure, increase the number and beauty of the flowers, develop the fruits, sweeten the atmosphere, and drive away disease. The sun's rays, being always perpendicular, in the middle of the day are very intense. In the shade, however, it is never uncomfortable.

Flora and Fauna.—The physical conformation of Mexico is most favorable to the development of a wonderfully rich and varied economic flora. In the hot lands or coast regions, from the sea-level to an altitude of 1,500 or 2,000 feet, cocoanuts, cacao, vanilla, peppers, nutmegs, ginger, cloves and other spices and all the fruits of tropical countries are successfully and profitably grown; while sugar cane, coffee, rice, cotton, tobacco, hemp, oranges, lemons, limes, bananas, mangoes, apples, peaches, papayas, pears, plums, figs, cherries, grapes, zapotes, pineapples, mameys, pomegranates, yams, sweet potatoes, Irish potatoes, most of the edible roots, and in fact about all the varieties of fruits and vegetables grown anywhere are found and successfully cultivated in altitudes up to and including the valley of Mexico, 7,500 feet above the sea. Wheat, corn

CATHEDRAL IN THE CITY OF MEXICO

Photos by Kahle, Mexico

1 General Postoffice, City of Mexico

2 Corridor in the General Postoffice

and most of the grains of commerce produce crops in some of the states, twice or three times in a year — notably in Vera Cruz, Tabasco, Chiapas, Oaxaca, Guerrero, Michoacán, Jalisco, Mexico, fifty-two species of cereals and vegetables, 87 of fruits, 100 of odoriferous flowers, 56 of building woods, 21 of cabinet woods, 8 of gums, 3 of resins, 12 of forages and 113 of medicinal plants, reach a high degree of perfection in Mexico. Flowers of almost innumerable varieties, from the gorgeous orchid of quaint and curious form and wonderful combination of colors, to the modest daisy, violet and tuberose, grow wild, in extravagant profusion, all the year round, the range of altitudes meeting the requirements of all the members of the floral kingdom The flower markets of Mexico City, which are chiefly supplied from the chinampas (gardens in the bed of the half-drained lakes of the neighborhood), are among the objects of interest most enjoyed by the visiting tourist, and they testify to the beauty and brilliancy of the Mexican flora. This country has been deservedly named "the land of flowers," for everywhere and all the year there are flowers of every hue and color. In the forests of the republic, especially in the tropical lands, are found many varieties of trees the timber of which possesses great value for building or cabinet purposes. Pine of several varieties, balsam, lignum vitæ, Spanish cedar, mahogany, oak, rosewood, mesquite, olive, palm, almond, fir, sesame, cedar, camphor, india rubber, copal, cacao, 12 species of dye woods and numerous varieties of oil-bearing trees are among the varied products of the country, the arboreal vegetation of which embraces 114 different species of woods. Included in the fauna of Mexico are the American lion (puma), jaguar, ocelot, wildcat, wolf, coyote, bear, wild boar, sloth, monkey, hare, rabbit, squirrel, armadillo, deer, beaver, otter, mole, marten, leopard, turtle, which are principally found in the sparsely settled mountains and in the forests of the tierra caliente. None of these are much hunted, the inhabitants of the country having little or no taste for this kind of sport. In the tropics there are many varieties of rich plumaged birds, and song birds are found in all altitudes. Parrots and parakeets abound in the coast regions and are highly prized for their talking qualities and brilliant colors of green, yellow and red. Among the many species of song birds are the zenzontla or mocking bird, the clarin and the nightingale. The birds of prey include the eagle, hawk, turkey buzzard and owl. The cotorra, talking loro, humming bird, sparrow, blackbird, turtle dove, woodpecker, swallow, magpie, heron, falcon, kite and great numbers of others, which inhabit the forests or fields where there is abundance of insect and other food for their sustenance, are found in Mexico. In all localities where there are fresh-water lakes, lagoons, ponds or rivers there are great numbers of wild ducks and geese, and in the forests the wild turkey abounds. Wild bees are numerous, and the Indians derive quite an income from securing their honey and marketing it in the cities and towns. Of domestic or barnyard fowls the number and variety are very extensive, and their consumption is enormous. The waters of the Mexican gulfs, lakes and rivers are well stocked with many varieties of fish of excellent quality, the most prized being the red snapper. The markets of Vera Cruz, Tampico and other coast cities daily display a tempting supply and variety from the gulfs, the Pacific and the accessible rivers; and large quantities are shipped to inland points by railway, in refrigerator cars. In the immediate vicinity of Tampico many tarpon of large size are caught. Of reptiles there are many varieties, both venomous and harmless, especially in the southern forests. In the first named class are included boas, covals and rattlesnakes. There are many varieties of scorpions, tarantulas and lizards, some of the latter being so large as to be utilized by the natives as an article of food. To the latter class belongs the iguana which often measures over five feet in length.

2. MINERALS AND MINERAL PRODUCTION. For three centuries Mexico was the greatest of silver producing countries; from the single camp of Guanajuato came one-fifth of the silver mined during that period; and for one straight century the same camp gave to the world two-fifths of its silver. Yet to-day, after almost 400 years of exploitation, Guanajuato has still uncounted unexploited wealth. Yet Guanajuato is but one of many great Mexican mining camps, known to the world for centuries. Whether the natives of Mexico prior to the Conquest formally worked gold, silver and copper mines is an open question; but that they did exploit the placer deposits of the rivers of the country there is no doubt. Placer gold in quills passed as currency in Mexico at the time of the discovery and for years afterward. Gold, silver and copper ornaments, idols and other figures beautifully and often elaborately worked, existed in vast quantities at the time of the fall of the capital of the Aztecs. Since then, throughout four centuries, examples of the metal work of the natives of Mexico and Central America have frequently come to light; and still to-day explorers find these eloquent witnesses of the culture of the Indian empires of America in the graves of their nobles and princes and the ruins of their great cities.

Spanish Colonial Period.—With the fall of the capital of the Aztecs in 1521 there began a period of wonderful mining activity throughout the vast extent of the empire of the Montezumas. From the time of their landing on the shores of Mexico near the side of modern Vera Cruz in 1519, until the conquest of the city of Tenochtitlán two years later, Cortés and his followers were inspired by a dream of great wealth to be amassed from the treasure of the emperor of the Aztecs. This dream was made more vivid by the presents in gold with which the unfortunate Indian ruler sought to bribe his unwelcome guests to leave the country. After the fall of the city the Spanish adventurers awoke to find their dream of sudden wealth unrealized in so far as the capital of the Aztecs was concerned. But they lived in an age when strange fantasy colored the lives of men. If the much-desired El Dorado was not in Mexico City, then it was somewhere else; and the hunt for the golden treasure was continued. Thousands of buscones (prospectors) radiated in all directions from the capital in search of the hidden treasure. In this hunt mines of fabulous richness were discovered and towns sprang up

like mushrooms in the almost inaccessible fastnesses of the mountains. By 1537, when the first official report of the vice-regal government was made, the mining industry had become firmly established in many parts of the colony and was already paying important contributions into the treasury of the Spanish court. From the establishment, in 1535, of a settled government under the direct representative of the Crown, this mining activity increased with great rapidity and continued to extend itself farther and farther from the capital, the centre of colonial life in New Spain; and the dream of finding El Dorado was never altogether dissipated during the 300 years of Spanish rule in New Spain. While the glitter of gold was always before the eyes of every buscon the soft, white gleam of silver brought unexpected wealth to thousands who often squandered their newly-acquired fortunes in the search for the elusive yellow metal. How great was this treasure of silver wealth that Spain extracted from the rugged sierras of Mexico may be gleaned from a study of the report of the government mint. From 1537, when the newly-established royal mint issued its first statement of mining activity, to 1821, when Spain withdrew from the colony, the recorded silver production of the mines of Mexico amounted to $2,082,260,657. During the same period the gold output was only $68,778,411, or less than one-thirtieth of the silver returns. Large as these returns are, it must be remembered that probably not more than half the ore mined was ever reported to the government because of the excessively heavy taxes exacted by the Crown, which claimed as its right the royal one-fifth, and frequently, under one pretext or another, succeeded in extorting more from the mine owners. Quicksilver and powder, the most important aids of the miner in Spanish colonial days, were royal monopolies and consequently were sold in Mexico at from three to five times their market values. These and certain local, city and port exactions mulcted the miner of at least another fifth of the output of his mines. Transportation of ore from remote interior points, over almost impassable mountain trails, occupied from weeks to months in transit between the mines and the capital or the nearest port. Provisions and mining supplies had to be brought to the camp in the same slow and costly manner. All these extraordinary expenses made it possible for the miner to work only the richest ore and forced him to leave untouched veins which, in modern times, have become sensational ore-producers. It forced him also to sort out the richest of his rich ores and to leave the poorer on the dump heap. These dump heaps,, worked over by modern mining methods, have produced millions to foreign investors.

During the Spanish colonial period Mexico was literally the silver treasure-house of the world; and most of this wealth went to Spain; and it all, whether it went to the Crown or to Spanish adventurers and capitalists, contributed to make Spain the richest country in the world, thus shaping her destiny and making of her people a nation of adventurers seeking fortune in the vast colonial possessions covering the greater part of two continents, and disdaining the industries, trade and commerce. With her vast wealth Spain purchased from the rising industrial countries of those days, the Netherlands and England, what she required at home; and the mines of the colonies paid for it all. As a natural result, the national life of Spain was disrupted and the industries languished where wealth came so easily; and she taught the colonies to view life from her own point of view. Mining and the manipulation of vast estates became almost the only occupation of a gentleman. So, from year to year, from every mining centre in Mexico and the other Spanish American colonies, buscones were sent out constantly in increasing numbers to look for new mines. Men pawned their all to go on the same quest. Every decade witnessed its rush from one promising mining district to another. Taxco, Guerrero, was opened as a mining camp in 1522, the year after the fall of Mexico City; and from there numerous mining expeditions were sent forth to seek for new centres of wealth. One of these reached the far-distant state of Chihuahua in 1544. The discovery of Parral, Santa Bárbara and other rich mines caused a rush of miners from the centre and south of the country toward the north and west. In 1546 Zacatecas became the centre of this mining excitement, which began to shift, in another two years, to Guanajuato. In the same year the Bolaños mines of Jalisco began to attract attention and other centres of rich mineral deposits were discovered in Zacatecas. The following year Hidalgo came into notice through the sensational discoveries of ore at Real del Monte. All these mining districts are still producing ore with no signs of exhaustion and most of them are admittedly but partially exploited. In 1552 Durango was invaded and three years later, the discovery of bonanza ore in the Sombrerete mines brought the state of Zacatecas into the galaxy of shining silver stars. In 1574 Charcas, San Luís Potosí, opened silver mines destined to make the state famous. About the close of the 16th century, the chief mining interests of Mexico centred about Mapimí, Durango, which promised to become a great gold and silver producer. Scores of other more or less important mines were opened in the following years, among the most noted being Guadalcázar, San Luis Potosí, 1622; Batopilas, Chihuahua, 1632; Candelario, Chihuahua, 1638; Santa Eulalia, Chihuahua, 1700; El Caballo and other mines in the same state, 1703; the famous Magdalena district, Sonora, 1725; Talapujahua, Michoacán, 1740; a new Real del Monte district, 1759; the Valencia, Guanajuato, 1760; Catorce, San Luis Potosí, 1773 and La Purísima in the same state, 1780. All the districts mentioned were wonderful producers. The Mapimí mines, in Spanish times, made numerous owners wealthy, and since the establishment of the republic German capitalists have made of them one of the greatest gold and silver producing centres of the republic. The Batopilas mines have made the state of Chihuahua famous and attracted foreign capital to themselves and to neighboring mines. The recorded output of the Candelario mine for 100 years was $35,000,000, but so notorious was the avoidance of the payment of the government taxes, that the amount was undoubtedly very much more. At the beginning of the 18th century El Caballo claimed to be the richest mining district in the world. In 55 years its recorded output was over $85,000,000. The

Parral district, famous in Spanish colonial days for its wonderful richness, has, in modern times, under English, American, German and other foreign management, justified its reputation as one of the most extensive and generally mineralized districts in Mexico. The Real del Monte, which also produced wealth in Spanish hands, its output in one year being $15,000,000, has since, under English capitalists, extended its field of operations and has made itself known wherever silver is bought and sold. But the greatest single silver mine in the world is the Valencia, which paid to the government from 1766 to 1826 taxes on $226,000,000. It probably produced over $5,000,000 a year for 60 consecutive years. Vast sums of English and American capital invested in this district have done much to develop it along modern lines and to make it known. In the one year 1713 it is recorded as producing $14,000,000; and so much ore did it yield for a number of years that it made all its owners immensely wealthy. The Talpujahua mine in eight years yielded $18,000,000. The 17th century was one of development for Spanish miners in Mexico and the 18th one of wonderful production. Toward the close of this latter century the recorded yearly output of the mines of Mexico was $27,000,000.

The Revolutionary Period.— This, beginning in 1810 and continuing till 1821, disrupted all the affairs of the colony. Mining suffered so severely that it did not recover completely for nearly half a century after the Spaniards had left the country. In 1821 the output of the mines of Mexico had dropped to less than $5,000,000 a year.

From Iturbide to Díaz.— Mexico, under the administration of the emperor Iturbide, through the national congress in 1823, favored the development of the mining interests of the country. It abolished most of the exactions imposed upon miners during the 300 years of Spanish rule, and passed mining laws allowing foreigners to enter the mining business in Mexico. Notwithstanding the unsettled state of the country, the inducements offered to forign capital were so great that vast sums of English money poured into the country for investment in mining enterprises. This was the beginning of that great English influence which remained paramount in Mexican mining affairs until the beginning of the Díaz régime in 1876. During this period the records of the mints show silver $797,055,080; gold $47,327,383 and copper $5,227,855. Since then copper has become one of the largest and most important products of the republic. After the departure of the Spaniards from the country few people in Mexico were possessed of sufficient capital and knowledge to work the mines abandoned during the revolution, many of which had reached depths requiring powerful pumping and other machinery and exploitation on an extensive scale to make the business pay. The English were quick to see the opportunity thus presented; and many companies were formed to acquire and work these old mines and to exploit new ones. In six years (1822–28) six powerful English companies, with a combination capital of 3,000,000 pounds sterling, entered the Mexican field. Among these companies were: The United Mexican Mines Association, owning mines in many states of Mexico; the Anglo-Mexican Company, which also acquired many mines; and the Real del Monte Company. These English companies did what the Spaniards had never been able to do. They transported powerful modern pumping and other machinery over apparently insurmountable sierras and made it possible to work the rich ore below the water level of vice-regal days. They thus practically created new mines. Among these British investments are included most of the famous mines of those days; Valencia, Mellado, Villalpando, La Luz, Charcas, Catorce, Fresnillo, San Ildefonso, San Dimas, San Francisco, Guanacevi, Parral, Santa Eulalia, Batopilas, Real del Monte, Santa Gertrudis, Blanco, El Oro, Temascaltepec, Bolaños, Tezhuitlán (famous copper district), Taxco and Real del Castillo.

From Díaz to Madero.— From 1857 to 1883 the control of the Mexican mining laws was in the hands of the officials of the state governments. This did a great deal of harm to mining interests, created confusion and laid the door wide open for grafting. So in 1883 the Federal government was forced to assume charge of the direction of all mining affairs. At the same time a commission was appointed to consider the mining situation and to reform the mining laws, which it did in such a liberal spirit that mining again took a fresh and vigorous start. Porfirio Díaz began his administration in 1876 with a broad view of the necessities of his country. He extended the hand of welcome to capitalists of all nations who might help him to realize his dream of a greater and more prosperous Mexico. When Díaz returned to power in 1884 after González' four years of office, he continued vigorously the policy of encouraging the mining interests of the country, which during his first term of the presidency (1876–80) had reached the value of $103,000,000 gold and silver, with the additional potential energy of hundreds of new mining claims registered, properties opened up and many abandoned mines put into operation once more. About this time American, German and French capitalists appeared upon the scene and began to compete vigorously with English investors for a share in the Mexican mining business. By 1884 this competition had already become strong, and from then on it grew in intensity until, in 1913, when the revolution practically halted mining throughout the republic, it had assumed large proportions. Of the newcomers the Americans were the most aggressive. In 1884 Edwin Ludlow, representing American capitalists, began boring for coal in Mexico; and five years later the great coal deposits of Coahuila, at Sabinas and other points, were in full operation. In the 10 years following 1895 over 6,000,000 tons of coal were mined in Mexico, and by 1910 the output had reached 1,500,000 a year. The discovery and exploitation of coal in the republic gave great impetus to mining and other industries. Between 1885 and 1910 Lower California, Michoacán, Coahuila, Sonora and Puebla became great copper-producing states and as such attracted large sums of foreign capital, American and French; and the production of copper rose from 11,620 tons in 1895 to 55,000 tons in 1905. Owing to the slump in the price of this metal, this increase was not kept up during the next five years. Copper and petroleum and its products

were, however, the only mining interests that continued active throughout the revolution, the output of the former being valued, in 1912, at $38,500,000. Mexico ranks easily in second place among the great copper-producing countries of the world. In 1906 official returns showed in the republic 35,087 copper mines and mines containing copper values. After eight years of exploitation of antimony Mexico had, in 1910, become the world's greatest producer of this metal, with vast deposits still untouched. Two years later her production of antimony had reached almost $2,000,000 per annum. At the beginning of the first Díaz administration capitalists began to pay attention to the gold deposits of the country, with the result that, between that date and 1909, considerably over $1,000,000,000 gold was mined. Even in 1912, notwithstanding the revolution, the gold mined was valued at over $50,000,000, while the fiscal year 1908–09 had produced $62,700,000. In 1894 the introduction of the cyanide process began to replace the old patio process, thus giving an added impetus to the mining of low-grade ores and this helped the mining business very materially. A few years later foreign capitalists began the utilization of water-power for the production of electrical power and electrical plants appeared in different parts of the republic. Of these the most extensive and important is that of Necaxa which supplies the power to light the City of Mexico and to run the tramways and many of the factories of the Federal District. It also furnishes 30,000 horse power to El Oro and electrical energy to other neighboring mining centres, including Pachuca. Mexico, on account of its mountainous nature, possesses a real wealth of water-power, which must soon be brought into use to develop her vast mineral riches, a very considerable part of which, owing to adverse natural conditions, still remains untouched. The most noteworthy development of the mineral wealth of the republic of recent years is to be found in the vast petroleum fields stretching down the Gulf Coast from Matamoras to Campeche, and probably farther, for the southern end seems to connect with the oil fields of Colombia. So great are these fields and so vast their wealth that Mexico must soon become the first oil-producing country of the world. Although oil was known to exist in Mexico for many years, it was not until 1901 that the Mexican Petroleum Company, a California corporation, began prospecting for oil in the neighborhood of Ebano, near Tampico. About the same time W. Pearson and Son came into the field, with unlimited English capital. Then followed a rapid development of the oil fields near Tampico and on the Isthmus of Tehuantepec, Tuxpam, Minatitlán, the Papantla district and other points in the neighborhood. By 1907 the production of oil in the republic had reached 1,000,000 barrels a year and by 1913, 16,746,000. Two years later the output was 35,000,000 of which about 75 per cent was exported and in 1918 it was over 60,000,000. The returns in the near future promise almost double that of 1915 owing to the great well of the Mexican Petroleum Company opened in December 1915, which is said to exceed in flow the whole oil output of the State of California. According to the report of the Mexican Secretary of Industry, Commerce and Labor (1918), there are over 600,000 kilometers of oil lands in the republic. These extend along the Gulf Coast, the coast of Lower California and the Pacific coast, of these only 15,000 have been exploited. See bibliography under article MANUFACTURES.

3. AGRICULTURE AND STOCK RAISING. In normal times the chief agricultural product of Mexico is Indian corn, which is valued at from $80,000,000 to $100,000,000 a year; yet, owing to the unscientific methods of cultivation still in use, it often happens that corn enough is not grown in the country for its own needs, in which case the government is forced to throw off the duty and, in extreme cases, to import corn itself in large quantities and to sell it to the masses at cost. The next most valuable product of Mexico is henequen which is valued annually at over $40,000,000. As the greater part of this product is exported it constitutes the chief wealth of Yucatán, which has grown to be, for its size and population, the richest state in the republic, though it was once the poorest. Although Mexico has never been looked upon as a wheat-producing country, yet the owners of large estates have lately come to realize that its capacities in this direction are practically unlimited and an annual output of wheat valued at over $20,000,000 is not uncommon, while this figure is sometimes exceeded. One of the products of Mexico which have become of national importance within very recent years is rubber (including *guayule*), the output of which was over $33,000,000 in 1911, with vast extents of young rubber plantations rapidly coming into bearing. The following statistics of the growth of this industry are eloquent:

YEAR	Rubber	Guayu
1906–07	$6,679,000	$ [illegible]
1907–08	8,892,000	1,2[illegible]
1908–09	8,719,000	4,541,[illegible]
1909–10	16,760,000	9,466,[illegible]
1910–11	21,188,000	11,70[illegible]

In the fiscal year ending 30 June 1911 the exports of henequen were valued at over $25,000,000; the cattle exports were $4,438,000, which did not include vast numbers which left Mexico without the knowledge of the government from those parts of the country under the control of rebel factions. Some of these went to Guatemala, but the greater part to the United States. In the same year the value of the hides exported reached nearly $10,000,000 from the territory controlled by the then existing government. In normal times the value of the products of sugar cane (sugar, alcohol, rum, molasses and cognac) is second only to that of corn, reaching, as it does, usually over $40,000,000 a year. This is a branch of the native industries which is capable of great expansion since Mexico possesses vast bodies of land suitable to the cultivation of sugar cane. The five years of the revolution showed a very considerable increase in the exports of coffee, rubber, chicle, tropical fruits, guayule, henequen, fine dyewoods, cabinet and building woods, tobacco and vanilla. Owing to the fact that the revolutionists had gotten possession of the great sugar state of Morelos the sugar cane output decreased to less than 1,000,000 pesos and the industry became practically paralyzed, from which condition it has not yet recovered, principally because the production of the sugar cane in

its products calls for the investment of heavy capital and the employment of skilled labor in certain departments.

A brief reference to the chief features of the agricultural industry of the country will prove instructive and interesting.

Sugar.— The greater part of the cane is grown at altitudes above 2,000 feet, but the best results are obtained in the lower country, where it matures sooner and where it may be cut twice annually without necessitating replanting more than once in upward of 10 years. In the Cuernavaca Valley, state of Morelos, the first sugar estates were cultivated by negro slaves, bought at Vera Cruz, at from $300 to $400 each. But the experiment proved unsatisfactory and free labor was soon substituted. Now the plantations are worked chiefly by Mexican labor and the mills are supplied with modern machinery.

Tobacco.— This industry is also developing great possibilities. The climatic and soil conditions, especially in the tropics, are very favorable to the best results, and whereas in Cuba the soil, after 400 years of constant use, has become comparatively unproductive, in Mexico no artificial stimulant is needed and the flavor and aroma of the tobacco are conceded to be equal to those of the Cuban product. The chief tobacco states are Vera Cruz, Oaxaca, Hidalgo, Tabasco and Chiapas. Much of the Mexican tobacco is bought up two or more years in advance of production and resold as fine Cuban tobacco.

India Rubber.— While there has been much unsatisfactory experimentation with the rubber tree, the failures have generally been chargeable to lack of knowledge or experience or to the introduction of illegitimate speculation at the expense of practical results. There now exist in southern Mexico a number of large and very successful rubber plantations, which have already proved that cultivated rubber can be made a paying proposition. These are chiefly in Vera Cruz, Chiapas, Campeche and Oaxaca.

Agave or Maguey.— This plant, from which is extracted the drink known as pulque, which the natives use in immense quantities, is perhaps the most important feature of the agricultural interest of the central plateau. Although pulque contains only about 7 per cent of alcohol, it is intoxicating when drunk in large quantities. It possesses important medicinal qualities, is a tonic and very nutritive. From 350 to 700 agaves or magueys to the acre are planted. They mature in eight years and give sap for a period of about five months, producing from 125 to 160 gallons of pulque each. The plants cost about $2 each by the time they have matured, and give a return of from $7 to $10 each. The pulque is secured by making a cavity in the centre of the plant, from the top, large enough to hold a few quarts, which are drawn out by rude syphons once a day. The leaves of the plants sometimes grow to be 12 feet long and weigh from 25 pounds to 100 pounds each.

Banana.— This fruit is successfully grown everywhere in Mexico between sea-level and an altitude of 5,000 feet. It is easily cultivated and very profitable. Frequently a return of $1,000 is realized from an outlay of $500 in a single season. A plantation of 1,000 plants, costing $500, will, under favorable conditions, earn this amount, even though the methods used be faulty, the care exercised insufficient and the variety poor. A favorable feature of banana growing is the fact that the ground occupied by the plants may also be utilized at the same time for the cultivation of coffee or other profitable products. Few other tropical fruits develop and become profitable as quickly as does the banana. Especially agreeable are some of the smaller varieties, although they may not be as much sought after as the larger and more pretentious ones. Their flavor possesses qualities not found in any other known variety.

Orange.— The oranges of Mexico are rapidly and surely winning favor in the markets of the North. Their true worth has only recently come to be understood and appreciated by consumers. Although the orange finds favorable conditions in all the tropical and sub-tropical states, the best results thus far have been attained on the shores of Lake Chapala, in the state of Jalisco and in Vera Cruz, Michoacán, Sonora, Morelos, Durango, Nuevo León, Oaxaca and Puebla. The leading producers in 1914 were Jalisco, Yucatán, Michoacán, Sonora, Morelos, Durango, Nuevo León, Oaxaca, Puebla, Sinaloa, Hidalgo and Vera Cruz. Although the oranges of La Barca, in the state of Jalisco, are considered the best in the republic, they have already found competitors in the products of Michoacán, Vera Cruz, Morelos and other localities equally favored by nature. The best results in orange growing are secured at elevations below 2,500 feet. The trees begin bearing when three or four years old and increase until the 12th or 15th year. Frost never occurs in any of the orange-growing regions of Mexico.

Lemon.— It is doubtful if any product indigenous to the soil of Mexico has been as sadly neglected as the lemon. So largely has it been relegated toward the lower end of the list of tropical fruits, in favor of the lime, that it can with difficulty be obtained in the markets, and when found is generally unsatisfactory in quality. And this, notwithstanding the existing very favorable conditions of soil and climate and the increasing demand in the world's markets. A very considerable part of the lemon crop of Mexico consists of wild fruit which, in many sections and especially on the Pacific Coast, is large and of excellent quality. It grows in the forests and jungles of the semi-tropical lands, at about the same altitude as the orange.

Lime.— This successful rival of the lemon, in Mexico, is grown chiefly in the states of Guanajuato, Puebla, Michoacán, Mexico, Jalisco, Oaxaca, Guerrero and San Luis Potosí. The lime of Mexico is of very excellent quality, but like the lemon and the orange, can be greatly improved by the adoption of proper methods of cultivation and the exercise of reasonable care.

Pineapple.— In the production of this fruit Mexico excels and is constantly improving her output. The towns of Córdoba and Amatlán, in the state of Vera Cruz, have long been noted for the size and quality of the pineapples grown in the regions round about them. The fruit is also successfully raised in the states of Puebla, Hidalgo, Tabasco, Chiapas, Oaxaca, Morelos, Guerrero, Michoacán, Colima, Jalisco and Nayarit. It thrives best at elevations of 2,000 to 3,000 feet. It was cultivated before the Con-

quest. Its leaves have for centuries been utilized to a greater or less extent in the manufacture, though by crude methods, of rope, twine, thread, mats, bagging, hammocks, paper and cloth of various colors. The value of pineapples grown in 1913 is given as $642,382, the chief producers named in the official reports being the states of Nayarit (then territory of Tepic), Hidalgo, Vera Cruz and Tabasco.

Other Products.— Included in the general category of agricultural products and of the numerous other articles closely allied to them, which are or can be successfully cultivated in Mexico, may be mentioned the yucca, or starch plant, which is said to contain six times as much nutritive matter as wheat, and which is grown principally in the states of Vera Cruz, Oaxaca, Chiapas, Tabasco and Yucatán; chicle, or chewing gum, of which over $4,340,000 worth has been exported to the United States in a single year; the mango, one variety of which (the Manilla) seems to combine about all the more delicate and delicious flavors of the choice fruits of the world. Being very perishable, it cannot be transported a great distance without suffering serious depreciation in value. The apple, peach and pear are all grown in various parts of the republic, but none has yet been brought up to anything like the standard of excellence reached in the United States, notwithstanding that almost all the natural conditions are exceptionally favorable to their cultivation.

Stock-raising.— The plains of northern Mexico and the valleys of the southern portion offer most favorable opportunity for profitably engaging in the livestock business. The climatic and other conditions are very favorable, the grasses are most nutritious. The transportation rates and facilities are such that cattle can be raised in Mexico and shipped to the markets of the United States at a good profit. An idea of the increase of this industry in Mexico may be gained from the reports by the government of the number of cattle exported annually. These show a regular and very considerable increase in normal times. The Para grass of the southern Mexican states is always green, grows luxuriantly and is very nourishing. It is estimated that an acre of this will feed two head of stock the year round, and that three acres in pasture will fatten four head. Because of the great number of flies and ticks in the low country, very young stock thrives better on the higher plains of Durango, Chihuahua, Michoácan, etc. Mexico has an abundance of sustenance to provide for an enormous increase of her present supply of livestock of every kind. The states of Durango, Sonora, Chihuahua, Nuevo León, Coahuila, Sinaloa, Tamaulipas, Vera Cruz and Michoacán constitute an admirable field for the carrying on of the cattle industry. As far back as 1883, there "roamed over an area of 300,000 square miles in the northern part of the country," according to a well-known writer, "1,500,000 cattle, 2,500,000 goats, 1,000,000 sheep, 1,000,000 horses and 500,000 mules, and there were 20,574 cattle ranches in the republic, valued at $515,000,000." Between the cities of Jalapa and Vera Cruz, and between Vera Cruz and Córdoba, great numbers of cattle were to be seen from passing railway trains, their sleek and well-rounded sides testifying to the excellence of the indigenous grasses before the revolution came to partially destroy an industry that promised to become very much greater in the near future.

The future of agriculture in Mexico is now apparently brighter than it has ever before been. The government has attempted to settle questions which have long been calling for solution; and among these none is of more importance than that of the division of land. The law of the republic calls for the subdivision of the large estates of the country and for the creation out of the Indian and mestizo population of a gradually increasing agricultural class which shall grow into a great middle class in the not distant future. See bibliography under article MANUFACTURES.

4. COMMERCE. The efforts of the various governments of Mexico since 1876 have been steadily directed toward the encouragement and extension of the commerce and industries of the country, external and internal. This has been done in the face of many and great difficulties. At the beginning of the Diaz régime Mexico was overburdened with debt, torn and wasted by revolution and party dissensions. Railway and other communications were lacking; and ports, harbors and regular coast and ocean routes, both passenger and traffic, in the modern sense of the term, were non-existent. Therefore steady and profitable international relationship had not yet been established. Mexico also lacked the educational knowledge and experience necessary for the building up of these. The third of a century spanning the beginning and the end of the Diaz régime witnessed a complete change in the commercial conditions existing in the republic. During this period harbors were constructed to accommodate great ocean-going vessels; international relations were extended and broadened; and the industrial, educational and commercial life of the nation quickened into notable activity. But the revolution of 1910 and the fratricidal strife that accompanied it set back the progress of the republic. Mexican commerce is peculiarly dependent upon the industrial and agricultural life of the nation because this alone makes possible the purchase of a vast number of foreign products. The disruption of the national life through the revolution vastly decreased the purchasing power of the Mexican people, and this, in its turn, very deeply affected its commercial activity. The almost complete destruction of the cattle business helped to still further intensify this arrested development. Along the old lines of its national life the income of the government declined in sympathy with the anarchical conditions existing throughout the country, to such an alarming extent that the most primary needs of the nation would have been lacking were it not for the fact that a new and important factor made itself felt strongly in the national life and largely supplied the lack in the national income by filling in the gaps caused by the lack of commercial activity throughout the nation. This was the rise to sudden importance of the mineral oil industry during the war years of 1914–18. But the storm and stress period through which the country passed from 1910 to 1919 is significantly reflected in the almost total lack of industrial and commercial statistics relative to the activities of the national life since the fiscal year 1912–13, when the last official census

was issued. This latter census represents the more or less normal life of the nation, which has been gradually returning to its pre-revolutionary condition throughout the whole extent of its territory.

From 1874 to 1904 the exports of merchandise from Mexico to the United States increased from $4,346,334 to $43,633,275; and the imports from the United States increased from $5,946,839 to $45,844,720. In the fiscal year 1912–13 the imports from all countries amounted to $195,772,000. Of this sum $16,466,000 consisted of animal substances; $31,285,000 of vegetable substances; $46,711,978 of mineral substances; $21,281,571 of dry goods; $12,074,088 of chemical and pharmaceutical products; $6,744,083 of spirituous liquors and other beverages; $5,120,770 of paper and its applications; $23,383,811 of machinery and its parts; $4,600,890 of vehicles; $5,388,344 of arms and explosives, and $9,604,897 of miscellaneous articles. In the same year the exportation totaled $300,405,000, the principal articles being: gold in various forms, $39,591,000; silver in various forms, $91,293,000; copper, $56,522,000; vegetable products, $85,963,000; animal products, $29,838,000; manufactured products, $3,549,000; miscellaneous, $2,917,410. Increase over the previous year, $2,416,000. Of the total importations $97,287,000 were from the United States; $25,220,000 from Germany; $25,900,000 from Great Britain; $18,338,000 from France; and $10,530,000 from Spain. The henequen exports, in the same period, were $30,134,000; uncured hides, $11,170,000; vanilla, $3,315,000; beans, $1,160,000; cattle, $7,552,000; leaf tobacco, $1,003,000; chicle (chewing gum), $4,342,000; fresh fruits, $1,019,000; zacate, $1,960,000; woods, $3,365,000; sugar, $860,562; Panama hats, $557,423; miscellaneous, $2,471,000. Of the total exportations $232,350,000 were to the United States; $31,147,000 to Great Britain; $16,438,000 to Germany; $7,151,000 to France; $2,182,000 to Spain. In the previous fiscal year the importations were $182,866,000, and the exportations $297,989,000. In the fiscal year 1894–95 the imports were only $66,200,000 and the exports $95,000,000, a remarkable record of progress in the brief period of 18 years.

The following table of exports and imports serves to show the progress of Mexican commerce during a very active decade of its history:

YEAR	Imports	Exports
1903–04	$177,861,000	$210,312,000
1904–05	178,205,000	208,520,000
1905–06	220,005,000	271,139,000
1906–07	232,230,000	248,018,000
1907–08	221,757,000	242,740,000
1908–09	156,533,000	231,101,000
1909–10	194,866,000	260,046,000
1910–11	205,874,000	293,574,000
1911–12	182,662,000	297,989,000
1912–13	195,772,000	300,405,000

In order to show the relative importance of the Mexican custom houses, both maritime and frontier, the following statement of collections of import duties for the fiscal year 1912–13 is given: Vera Cruz, $81,793,000; Tampico, $45,832,000; Laredo, $18,866,000; Juarez, $3,386,000; Progreso, $11,248,000; Ciudad Porfirio Diaz, $4,387,000; Nogales, $1,857,000; Mazatlan, $2,514,000; La Morita, $6,057; Frontera, $1,486,000; Agua Prieta, $1,208,000; Soconusco, $16,061; Guaymas, $2,239,000; Acapulco, $611,342; Isla del Carmen, $264,317; Ensenada, $383,662; Mexicali, $682,788; Chetumal, $480,602; La Paz, $206,722; Tuxpam, $743,322; San Blas, $151,602; Salina Cruz, $624,570; Tijuana, $212,847; Topolobampo, $147,310; La Ascencion, $52,730; Camargo, $5,540; Mier, $9,707; Puerto Angel, $10,827; Manzamillo, $1,486,000; Matamoros, $1,680,000.

In the upbuilding of the foreign commerce of Mexico, the construction of railways made possible the phenomenal results that have been achieved since 1898. The entire foreign trade of the country, practically, has been created since 1876, most of it since 1880. Before competition in the transportation of freight was provided, the rate from Vera Cruz to Mexico City, 264 miles, ranged around $68 per ton, going as high as $330 during the French intervention. Formerly almost all the first-class furniture imported by Mexico came from France, but now much of it is supplied by the United States and some of it is made at home. Most of the importations of agricultural machinery and implements are from the United States. The same is true of food stuffs, lumber, machinery for irrigation works, supplies for mining and for steam and electric railways, unmanufactured leather, vehicles, boots and shoes, canned goods, patent medicines, livestock, cotton, manufactures of steel and iron, sewing machines and typewriters. From Spain and France come most of the wines and cognacs. In normal times Germany and Belgium had, previous to the European War, a monopoly of the hardware trade, England and France of the dry goods trade, and France of the trade in notions, jewelry and fancy goods. Among the leading articles exported by Mexico are coffee, two-thirds of which goes to the United States and the balance to England, Germany and France; vanilla, sugar, tropical fruits, beans, livestock, precious metals, henequen, leaf tobacco, hides, rubber and ixtli.

Mexico has a "commercial code" which dates back to 1887 and which, among other things, provides that foreigners shall be free to engage in commerce, subject to the same conditions and requirements that apply to citizens; that all documents referring to matters of public concern shall be recorded in a public register; that all business correspondence shall be preserved; that notice by circular or through the press shall be given of the character of any business about to be established and of any modifications or other changes subsequently made; that at least three account books,— a general day book, a book of inventories and balances and a ledger,— shall be kept in the Spanish language; that all brokers must be Mexicans by birth or naturalization, have a mercantile education and possess a diploma from the Minister of Fomento or other proper officer; that an unlawful agreement or contract involves no cause of action at law; that mercantile companies may consist either of a partnership under a collective name or with special partners, or may be an anonymous (stock) company, a society with special partners or a co-operative society; that all contracts for the formation of companies must be in writing and very full and explicit; that the consolidation of companies cannot take effect until two months after publication of particulars, except

on payment of all debts; that foreign companies must register in Mexico and publish an annual balance sheet; that there may be "temporary" or "profit-sharing" mercantile associations, the first being without a firm name and making partners jointly liable to third persons, and the last named implying an association under which two or more persons may become interested in operations which one or more may undertake in their own names, but which involve only one legal entity and no responsibility on the part of a partner not joining in a contract with a third party; that the principal of any manufacturing or commercial business shall be responsible for the acts of his managers or employees; that no institution of credit can be established except by authorization of the Minister of Finance and the approval of Congress; that every merchant ceasing to make his payments, whose liabilities are more than 25 per cent in excess of his assets, who has made formal assignment of his goods, or who has absented himself without leaving any person in charge of his business who can pay his debts as they become due, shall be considered a bankrupt.

Foreign commerce for year ending 30 June 1914 (estimate of exports) $176,000,000; (estimate of imports) $65,000,000; total $241,000,000. For the year ending 30 June 1915, the estimate of the value of Mexico's exports was $150,000,000; imports $61,000,000; total foreign commerce $211,000,000. Imports from the United States in the year last mentioned (estimated value) $34,200,000, and exports to the United States $115,000,000. The imports into the United States from Mexico in 1916 totaled $105,000,000 and the exports to that country reached $53,000,000 in the same year. In the nine months ending with March 1917, imports from Mexico were $80,692,000 and exports $47,501,000. In May 1917 the Mexican government prohibited the exportation of food stuffs and food animals to the United States because of the depleted stocks and herds in the country owing to the revolution. See bibliography under article MANUFACTURES.

5. MANUFACTURES. Mexico is a manufacturing country in the very primitive sense of the word; for literally the greater part of her manufactured products are made either wholly by hand, by individual tradesmen each working on his own account, or in small shops where the machinery used is employed simply to aid the cunning of the hand. The field for manufactures of all kinds is most promising, since it offers raw material in great abundance, efficient, intelligent labor and a very considerable home market, with a still larger one in Central and South America.

Manual training has been introduced into the schools of Mexico and several arts and trades colleges are turning out skilled mechanics in all lines of industrial work. Wages are low, much lower even than in Europe, and the native workman in the factories already established throughout the country gives his employer little or no trouble.

Cotton.— In 1912, the last normal year since the outbreak of the revolutionary war that overthrew the autocratic Diaz régime, there were 148 cotton mills in the republic. Of these the largest and most modern were in Puebla, Orizaba and Mexico City. In these factories 32,000 workmen were employed to operate 62,000 spindles and 27,000 looms. The cotton goods they produced during the year were valued at over $50,000,000; and included sheetings, tickings, lining, drills, shirtings, percales, quilts, napkins, table-cloths, woolen-cotton goods, knitted garments and fleece-lined underwear. The Atlixco cotton factory, Puebla, employed, in the same year, about 2,000 hands and is capitalized at $6,000,000; the Compañia Industrial de Orizaba owns four cotton mills, has 4,000 looms and 10 printing machines in commission, is capitalized at $15,000,000 and employs 6,000 mill-hands. The San Antonio Abad, with an invested capital of $3,500,000, also operates four mills, three in the state of Mexico and one in Mexico City. El Porvenir y Anexas, at Villa Santiago, Nuevo León, is capitalized at $2,000,000, and the Veracruzana, of Santa Rosa, in the state of Vera Cruz, near Orizaba, at $3,500,000.

Woolen Goods.— There are a number of woolen factories in Mexico; but they are of less importance than the cotton mills, for the reason that the great mass of the lower classes wear cotton garments, thus creating a strong and constant demand for the latter goods. There are woolen mills in Durango; Aguascalientes, Guanajuato, Hidalgo and Puebla; but the most important establishment is near Tlalnepantla, in the state of Mexico and not far from the federal capital. The woolens made in the republic include suitings, kerseymeres, carpets, blankets, rugs and knit goods. The city of Saltillo, Coahuila, is noted for its handsome serapes (native blankets), for which there is a constantly increasing demand. These serapes, which are made on primitive Indian looms are exceedingly well woven, of fine texture, brilliant colors and pleasing designs. The San Ildefonso factory at Tlalnepantla, with a capital of one and one-half million dollars, is one of the most successful manufacturing enterprises in Mexico and its goods are to be found on sale throughout the republic.

Silk.— Few countries have the natural advantages for raising and manufacturing silk possessed by Mexico. Throughout the greater part of the republic both white and black mulberries grow luxuriantly and require practically no care even in those regions less favorable to their cultivation. So even is the climate in most parts of the country that silk worms can be grown out of doors practically all the year round; and they require but a small part of the care they must necessarily receive in Italy. Labor in Mexico is cheap and the masses of the people, once accustomed to cocoon raising and the cultivation of the mulberry tree, might be expected to thrive at the business as their ancestors did in all the industries, before Europeans came to disturb the current of their national life. The Indian is industrious when he works on his own account.

In Mexico City there is one important silk factory, which is engaged in manufacturing rebosos, the light shawls which the Mexican women of all classes wear almost universally everywhere outside the larger cities. This factory received strong encouragement from the Mexican government which has, for some years, been anxious to establish the silk industry on a firm basis in the republic. Two great nurseries near the capital, one at Coyoacan and

the other at Churubusco, began in 1907 the planting of 6,000,000 mulberry trees, from which it was proposed to send out free propagation slips to all parts of the country wherever people could be induced to plant trees and to go into the business of silk raising.

Textiles and Fibres.— There is perhaps no industry in Mexico that shows more variety in forms of manufacture than that of fibre-plant products. Rope, cordage, thread, packing, carpets, rugs and practically every form into which linen, hemp, jute, ixtli, henequen and other native fibre plants and textiles are made, are manufactured in Mexico. Among the most important textile and fibre goods factories in the republic are La Aurora of Cuautitlán, near Mexico City, which has an invested capital of $1,300,000 and turns out bags and packing of all kinds; La Industrial Manufacturera Company, capitalized at $4,000,000 and operating six factories; the Linera de Mexico Company, capital $600,000; Santa Gertrudis Company, near Orizaba, capital $1,000,000, hands employed in normal times from 1,300 to 1,500. All over the republic, wherever the numerous fibre-plants grow, which is almost everywhere, on highlands and lowlands alike, the natives carry on the manufacture of rope, cord, string, thread and coarse wrapping cloth just as their ancestors did before the Conquest. These products of the country can be found from the Rio Grande to Guatemala. Ixtli (agave rigide), a rather coarse century plant, furnishes a considerable part of the raw material for this industry. The maguey (agave Americana), from which the native pulque is extracted, also supplies raw material for the coarser kinds of rope, cordage and sacking. Even mats and rugs are made from it. In addition to the large and very general consumption of these goods, the exports to foreign countries amounted, in 1912, to $3,792,678.

Among the other fine fibre plants of Mexico are zapupe and pita, both of which furnish long, silky, strong commercial fibre, which is not exported because the home consumption demands more than the output. The best known, commercially, of all the fibres of Mexico is henequen grown in Yucatán and the neighboring states of Campeche and Chiapas, and to a small extent, in other parts of the republic. From the finer fibre of this plant there are manufactured in Mexico many varieties of woven fabric that resemble silk in appearance and softness of texture. In fact there are in Mexico numerous fibre plants that offer more or less acceptable vegetable substitutes for silk. Since time immemorial henequen has been manufactured, in Mexico, into rope and cordage of all kinds; but now it is exported, principally to the United States, for the making of binding twine for reapers. Though no country in the world is richer than Mexico in excellent fibre plants, yet she imports large quantities of linens, hempen fabrics, yarns, laces, handkerchiefs, trimmings, carpets, rugs, curtains, quilts and almost every kind of goods manufactured from the various fibre products, all of which could be made at home from native-grown products at a great saving to the nation. Characteristic products are the huge, highly-adorned, sugar-loaf, native felt sombreros and the so-called Mexican Panama and other straw and reed hats. Most of the latter are made by individuals in their homes. The natives display much taste in this work, which is another of the numerous industries of the country handed down from father to son for hundreds of years. La Abeja (The Bee), in the Federal District, near the capital, with an investment of $500,000, is the most important of the hat factories of the country. In Mexico, Guadalajara Puebla, Vera Cruz and Oaxaca there are from one to a score or more smaller hat factories, each of which has its own wholesale and retail store. In addition to these there are little shops that do a purely local business.

Beer, Wines and Liquors.—There is a large consumption of distilled and fermented liquors in Mexico, a very considerable percentage of which is made in the country. Within the past 10 years beer has come into favor, in the cities and larger towns, and it may be found on sale even in the smaller interior towns and villages, though there the consumption is slight. Its use is confined to the middle and upper classes almost exclusively because its price puts it beyond the use of the laboring class. There are large and well-equipped breweries in Mexico City, Oaxaca, Monterey, Puebla, Vera Cruz, Orizaba, San Luis Potosí and Tampico, while installations of lesser importance exist in several of the smaller cities. In the capital there are several distilleries where whisky, brandies, cognacs and cordials of various kinds are made. In the Parras district of Coahuila and in some other parts of Mexico excellent wines are produced, and wherever sugar is grown, which is pretty general in the low, hot lands of the coast country, aguardiente (native rum) and excellent alcohol are manufactured. Many of the sugar plantations possess the most modern plants for making these products. Much of the Mexican aguardiente is shipped to Europe where it is turned into cognac. Tequila, a strong alcoholic liquor somewhat like Holland gin, is manufactured extensively in Mexico, but most of the output is consumed at home, for its use is general throughout the country. Like pulque, tequila is manufactured from the century plant. The use of pulque is more extensive than that of either tequila or aguardiente; but it is confined to the upland plateaux and the country at an elevation of 4,000 feet or more, because there grows the maguey from which it is manufactured. On the uplands it has been, for many years, the greatest of the industries of the country, after mining, millions of acres being devoted to the growing of the maguey. Another distilled product called mescal is made from another and smaller species of the agave; and it is extensively used in the region where this latter plant thrives.

Soap, Candles and Chemical Products.— A great part of the raw materials used in these industries is still imported though the republic is capable of producing most of them. The Laguna Soap Company, capital $5,000,000, formed by the amalgamation of two large cottonseed-oil companies, produces daily in normal times and conditions, 400 tons of cottonseed oil, 7,500,000 pounds of soap and 2,000 metric tons of glycerine, together with a variety of edible cottonseed-oil products. It employs from 800 to 1,000 men. La Union Soap Factory of Torreón, capital $2,000,000, is engaged principally in the manufacture of soap

and glycerine. The company also has a large refining plant near Torreón. There are a number of smaller soap and many candle factories scattered throughout the republic. Chemicals, paints, varnishes and acids are also manufactured in or near numerous cities and towns. A few years ago all the petroleum and petroleum products used in Mexico were imported and sold in the republic at excessively high prices. Now petroleum, benzine, kerosene, paraffine wax, asphalt and many by-products are manufactured in the country; and native oil has become an important factor in the national life. Whole railway lines use oil burners on their engines and petroleum is employed for producing motive power in many kinds of industrial life. Yet but a very small percentage of the possible native oil sources has been exploited; for the oil belt extends all the way from Texas to Guatemala on the Gulf side and large deposits are known to exist on the Pacific Coast. The refining of crude petroleum has become a business of considerable importance in Mexico and the exploitation of the asphalt deposits has already influenced the pavement of the streets of the cities and larger towns of the republic.

Iron and Steel Products.— No other Mexican industry has grown so fast within the past dozen years as that of the great iron and steel foundries now turning out products equal to those of the steel-producing centres of the world. This output includes smaller agricultural implements, marketable iron and steel, and a constantly increasing number of finished products such as are turned out from the great American and European steel plants. The Monterey Iron and Steel Company, capital $10,000,000, with its great blast furnaces, produces 300 tons of steel per day. It makes steel rails and structural iron and steel in vast quantities and of excellent quality. Monterey is the most important centre of this new industry; and naturally there the business has reached the highest state of perfection in the republic. The steel and iron industries of Richard Honey, in Hidalgo and the Federal District, are next in importance to those of Monterey. Two other important iron foundries in Jalisco rely chiefly upon local trade. One of these at Zapalapa supplies iron to Guadalajara, Aguascalientes, Manzanillo and surrounding country.

Guayule.— In Mexico the production of rubber is a real manufacturing industry in certain parts of the republic where the guayule plant grows in abundance. This plant is a low shrub from two to four feet in height from which crude rubber is extracted by means of specially constructed machinery. The plant is torn out by the roots, is crushed and the sap extracted from it. It then undergoes certain processes before it becomes commercial rubber. The Guayule Rubber Company produced in this way, in the first seven months of 1912, 1,818,880 pounds of rubber. The International Rubber Company of Torreón, which is capitalized at $37,500,000, possesses 2,000,000 acres of land in the state of Zacatecas, on which wild guayule grows abundantly. The company has an extensive factory at Torreón, in which is installed the most modern rubber machinery. The guayule exported from Mexico in the fiscal year 1912–13 was valued at $7,234,000, which was only about $1,000,000 less than the value of the tree rubber grown in the country during the same period. In 1911–12 the guayule exports brought $11,798,800.

Tobacco.— There are many cigar and cigarette factories in Mexico; but the latter far exceed the former in volume of business. The principal tobacco manufacturing centres are Mexico City, Orizaba, Puebla, Jalapa, Vera Cruz, Cuernavaca and Guadalajara. But there is scarcely a city or town in the republic that does not make either cigars or cigarettes or both for local consumption; and each manufacturing district has its own favorite local brands. In the city of Mexico an immense number of cigarettes are made, the Buen Tono Company turning out alone daily about 20,000,000; and the Tabacalera makes about 4,000,000. But these companies are backed by millions of capital. In the Buen Tono's factories (including the Cigarrera Mexicana), 1,700 hands are employed. Certain brands of Mexican cigars are favorably known in Europe and in the United States.

Packing Houses.— There are a number of packing houses in Mexico. Several are on the Pacific Coast where the cattle ranges are more or less isolated from the European and American markets; but the National Packing Company, with a capital of $7,500,000, operating from its headquarters in the capital, is the largest and most important, and does an international business.

Paper.— Paper is made (though not enough for local consumption) by the San Rafael and Anexas Company, situated near the capital. This institution, which is capitalized for $7,000,000, has two factories, a pulp mill and extensive forests from which it draws its raw material. Though the output of San Rafael runs to the commoner grades of paper, including large quantities of newspaper print, yet it also makes high-grade paper of numerous styles and degrees of fineness, among these being calendered and the finer grades of half-tone paper.

Dynamite and Other Explosives.— These, including giant powder, are manufactured in Mexico; and the government has its own ammunition factory at Santa Fé, near the capital. The Mexican National Dynamite and Explosives Company, at Dinamita, Durango, produces over 50,000 pounds of explosives daily. It is capitalized at $3,400,000 and employs from 900 to 1,000 hands.

Flour Mills.— Large flour mills, modern in every respect, and others of smaller capacity and more primitive types, are to be found in Mexico from Monterey to Yucatán. Of these the most modern are: El Hermosillense, Hermosillo; the Chihuahua Flour Company, Chihuahua; the Goleta Mills, Saltillo and Monterey; the Phoenix Mills, Saltillo; the Esmeralda Mills, Monterey and Ramos Arizpe; the Alliance Mills, Torreón; the Diamond Mill, Gómez Palacio; the Gulf Flour Company, San Luís Potosí and Mérida; Aurelio Herrera and Company, Irapuato; the Union Mills, Toluca; the National Flour Manufacturing Company, Mexico City; the Bakers' Mutual Association, Guadalajara; and La Perla Mills, Aguascalientes.

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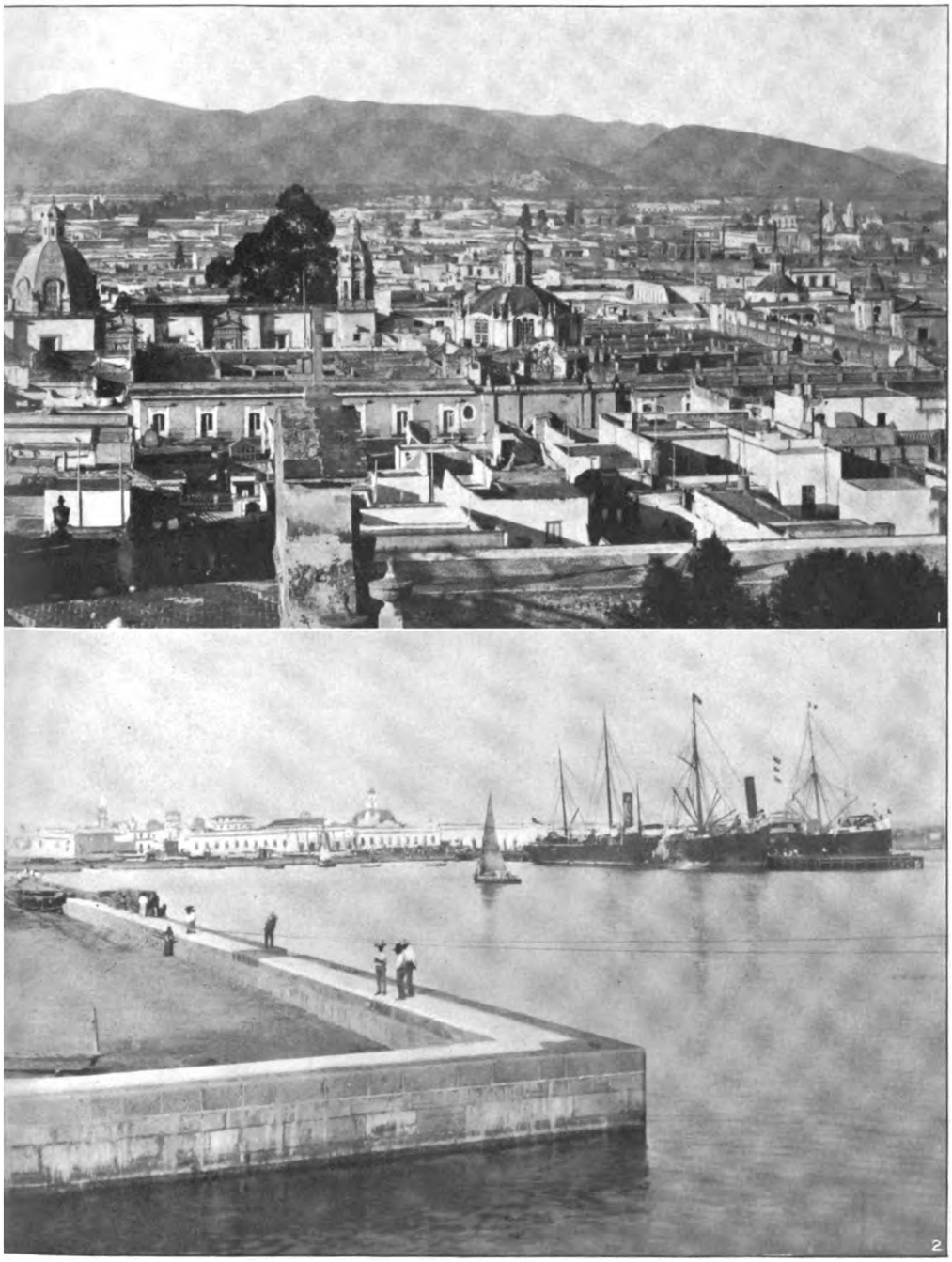

1 Guadalupe, from tower of Cathedral

2 The new harbor, Vera Cruz

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6. TRANSPORTATION AND COMMUNICATION. Before the white man had set foot in Mexico the various nations then occupying what is now the Mexican republic had built many well-paved roads and innumerable mountain trails, in all probability better than the trails of to-day, if we are to judge them by their still existing remains, and by the ruins of the great and populous cities whose arteries they were. Following the Conquests, and as Spain gradually extended her power over her trans-Atlantic domains and as peace became established upon a firm basis, bringing with it an extension of trade, the necessity for an extensive system of highways between the inland cities and the ports and between city and city became apparent. The Spanish government, ever alive to its own interests, began the construction of the *caminos reales,* or king's highways, which, a century after the Conquest, had already connected together all the centres of commercial importance in New Spain.

Transportation Facilities of the Republic. —Throughout the revolutionary period (1810–21) transportation facilities of every kind in Mexico were neglected, on account of the activity of the revolutionists and the exhausted condition of the Spanish treasury after the Napoleonic wars. From 1821 to 1876, the new republic formed upon the ruins of the government of New Spain was so occupied with its own local dissensions that it found little time to give to upbuilding of highways and byways of communication. Yet it was toward the close of this period of unrest that the first railway was built in the republic. In 1854 a line connecting Mexico City and Guadalupe, a distance of three miles, had been constructed; and a year later Vera Cruz was connected with Tejeria (12 miles). These were the two extreme ends of a railway by means of which it was proposed to give the capital an all-rail route to the first port of the republic. But so slow was the work of construction that it was not until 1873 that this comparatively short line (263 miles) was completed. Practically no other railway construction was undertaken in Mexico until after the election of Porfirio Diaz as president in December 1876. In November of the following year, the Secretary of Public Works signed a contract with James Sullivan and his associates for the construction of a railway line from the United States border to Mexico City, and from there to the Pacific Ocean. But Sullivan found difficulty in getting the capital necessary to build the proposed lines. In 1880 a strongly-subsidized concession was granted to the Mexican Central Railway Company, organized in Denver to build a wide-gauge railway from El Paso to the Mexican capital; and about the same time the Sullivan concession was extended and rearranged so as to empower the holders thereof to construct a narrow-gauge railway from Mexico City to Laredo, on the Texas border. Both these lines were eventually built. From 1880 to 1898 hundreds of railway concessions were granted by the Mexican government, most of them accompanied with subventions in cash, government bonds and national lands. Such a very active railway era was inaugurated that, in 1890, the government found it necessary to create the new Department of Communications and Public Works, at the head of which was a minister of the Cabinet. In 1898 Finance Minister Limantour announced that, in the future, the government would give subventions only to roads of great political and financial importance. In the plan for railway extension laid down by Mr. Limantour at this time were included a road to connect the centre of the republic with some Pacific Coast port, Guaymas or Topolobampo preferred; a line from the interior to Mazatlán; another from the interior to Manzanillo and a fourth to Acapulco. The plan also included lines to connect the capital with Acapulco and Tampico. The following year a new general railway law was issued in order to co-ordinate the work of the Minister of Finance and to govern the roads in existence and those being built. The most important railway lines of the country were constructed between 1880 and 1890; after which very little building was done until Mr. Limantour took matters in hand in 1898. By 1902 the following roads had been constructed: The Mexican Railway, connecting Mexico City with Vera Cruz; the Mexican Central, from El Paso to the Capital; the Mexican National, from Laredo to Mexico City; the Sonora Railway, from Nogales to Guaymas; the Interoceanic, from Mexico City to Vera Cruz; the Tehuantepec National, across the Isthmus of Tehuantepec, from Coatzacoalcos. (Puerto Mexico) to Salina Cruz; the Mexican Southern, from Puebla to Oaxaca; the United Railways of Yucatán; and the Pan-American, from San Gerónimo, on the Tehuantepec road, to a point in Mexico close to the border of Guatemala. In 1906 the Mexican government succeeded in uniting the two great railway lines, the Mexican National and the Mexican Central, with the "National Railways of Mexico." By 1908 the Mexican International, the Pan-American, the Vera Cruz and Pacific, the Interoceanic and the Tehuantepec National had been brought under the control of the government and included under the foregoing title of the National Railways of Mexico. During the revolutionary period from 1910 to 1916 the railroads of Mexico suffered very greatly; much of the rolling stock was destroyed and bridges, stations and other buildings were burned or wrecked. In January 1915, according to a statement of the Mexican Minister of Railways, the total monthly income of the Mexican National lines was only 647,000 pesos (paper currency). But in August 1916 the monthly income of these

roads had risen to 25,000,000 pesos (paper currency). At the same time the transportation of freight had become almost normal, notwithstanding the fact that the loss of the National Railways for the fiscal year 1913–14 was $28,835,624, and for the following year $28,909,328. When the Carranza government undertook the management of the railways in June 1915, it had to face a deficit of $41,289,609 United States currency. Since then the railway income has steadily improved. In 1916 there were over 16,000 miles of railway in operation in Mexico. During the fiscal year 1917–18 the total receipts of the Federal Railway was $72,000,000.

Postal Service.— In 1913 there were in Mexico 2,917 post offices, branch post offices and postal agencies. In the postatl service of the republic about 15,260 miles of railway, 300 miles of street railway and 10,000 miles of steamship routes were in use for the distribution of postal matter. During the year domestic postal orders to the amount of $48,771,821, and foreign postal orders valued at $8,886,979 were issued. During the same period the other income of the postal service was $4,914,640. All the railroads of the country disposable were made use of in the postal service; and they were aided in the work of distribution by messengers, horses, mules and automobiles, on land; by river boats of the interior navigation service: and by some 23 steamship companies, among which were The Mexican Navigation Company, the Pacific Navigation Company, F. Leyland and Company, Limited; West Indian and Pacific; Imperial German Mail, the Harrison Line, the New York and Cuban Mail Steamship Company, the Munson Steamship Line, the Atlantic and Mexican Gulf, the Southern Steamship and Banana Company, the Canadian Mexican Atlantic Line, the Kosmos Line, the Chinese Imperial Steamship Company and the Toyo Kisin Kaisha. There were 158 traveling post offices, principally on trains. During the year 26 new post offices were opened to the public. The parcel post service, which was instituted a few years previous, has proved of great value and is, year by year, securing more patronage. The government proposes to extend the scope of this service and to make it of still greater utility. Consult Halsey, F. M., 'Railways of South and Central America' (New York 1914).

7. BANKING AND FINANCE. The Mexican people have long shown a capacity for finance. In pre-Columbian days, the financial arrangements of the Aztec Empire were complicated and extensive; and the keeping of the accounts of the tribute rolls was in itself a matter that required more than ordinary executive ability, in an age when the whole income of an empire several times larger than modern Germany, and densely populated, was paid in produce of various kinds. This required vast storehouses in Mexico City and substations for customs receipts in many parts of the land. The Spaniards, too, are keen financiers and the mingling of the two races has produced a blend and a nation which has made great financial advancement during the past quarter of a century. The revolution of 1910 temporarily checked this financial expansion. The first financial establishment in Mexico that may be dignified by the name of bank, was founded, in 1776, in connection with the charitable organization still known as the Monte de Piedad (National Pawnshop). It handled mortgages, issued loans on landed and other property and circulated notes in commercial transactions, for more than 100 years. Several times it was in difficulties, but so great was the aid it lent to the community in general, that it succeeded, each time, in getting again on its feet. The first real bank organized in Mexico to do business in accordance with modern methods was the Bank of London and Mexico, which was established in the City of Mexico in 1864, with a capital of $500,000. Its reserve was finally raised to $30,000,000 shortly before the revolution of 1910, but was reduced to $10,000,000 in 1913 on account of the unsettled condition of the country. Previous to this date, the paper currency in circulation in the country had been issued by certain banks which had been granted concessions to this end. At first the National Bank of Mexico had a monopoly of this right, or claimed to have; but the government, disregarding it, gave concessions of a like nature to other federal and state banks. Finally an amicable arrangement was made with the National Bank, whereby it waived the rights in this respect which it had claimed. Then began an era of great prosperity in Mexican banking. Modern methods were introduced in the native institutions and foreign banking houses established important branch houses. These represented capital and institutions from nearly every country in Europe and from the United States and Canada. None of these foreign banking houses, however, had concessions to issue paper currency. They formed one of the most powerful factors in the development of the finances and the resources of the country and became the great medium of exchange between Mexico and the outside world.

As the Constitutionalist party began their campaign without money or credit, they were forced to issue paper money of many different kinds, which went as low as 1 per cent of its face value. As the military campaign became more extended and intensive more arms and ammunition were needed, and more paper currency was issued. The Madero revolution had been financed with coin, for Madero, his backers and his family were wealthy; but Carranza was not in this fortunate condition. It was, therefore, after the disappearance of Madero from the political scene, that the finances of Mexico began literally to go to pieces. Carranza had possession, in the beginning of his career, of only two or three minor ports of entry upon which to depend for any financial assistance from export and import duties. Thus the Constitutionalist party piled up obligations to the extent of 700,000,000 pesos Mexican currency back of which there was no assurance of redemption or any substantial backing of any kind. In addition to this, the country was flooded with the currency of other contending parties and with counterfeits of all paper afloat. Thus the amount of paper currency in circulation in the republic in 1916 when the Carranza government began to come on top will probably never be known. After the recognition of the Carranza provisional government by the United States, considerable attention was paid to the solution of the currency question, which had become of urgent importance. It was finally resolved to make a new issue of

500,000,000 pesos at the rate of 10 cents United States currency for one peso. This value was to be maintained by the sale of gold drafts in New York at the rate specified, in exchange for the new paper. It was to be received, at this rate, for duties, by the government. This was known as the Non-counterfeitable Issue, and was to be issued gradually in payment of salaries and other government expenses at the rate of about 50,000,000 pesos a month. However a very considerable part of the taxes imposed by the federal government had to be paid in silver. These included all export and import duties. The greater part of this went to swell the guarantee or reserve fund behind the new paper currency issue. At the same time that this new issue was being put into circulation steps were being taken to retire all the former issues authorized by the Constitutionalist party, whether state or federal. To this end all the bills of 20, 50, 100 pesos were declared (1 June 1916) no longer of compulsory acceptance and the holders thereof were notified to turn them in to the government, upon which they would get receipts promising redemption in specie, beginning 1 October, at the rate of five cents United States money (10 cents Mexican silver) for the peso. As the market value of this currency was only about two cents and as it had previously fallen as low as one-half a cent, the offer was a very liberal one and had the desired effect. In order to further facilitate the retirement of the old paper currency, all railway and telegraph dues were made payable in it up to 1 Jan. 1917. Owing to this clever campaigning on the part of the government, the metal currency, which had gone into hiding shortly after the outbreak of the revolution, began to reappear in 1916, with the increase in confidence in the stability of the Carranza government.

As Mexico had no national paper currency previous to the outbreak of the revolution of 1910, the bills in circulation being all bank issue, were kept at par value by a reserve of 50 per cent of the amount in circulation, exacted and guaranteed by law. During the revolution the banks nearly all violated this provision, issuing notes far in excess of their reserve. The Carranza government, after an investigation, gave the offenders a certain time in which to make good the required deposits under pain of being closed. This caused the rapid decline of the value of banknotes throughout the republic, both state and federal. In order to further guarantee the stability of the Non-counterfeitable Issue, $5,000,000 gold was taken from the national treasury and an additional $5,000,000 gold was obtained as a loan from the Henequen Regulating Committee of Yucatán; and all bank issues of paper currency were ordered withdrawn from circulation, the government thus retaining, in conformity with the provisions of the constitution, a monopoly of the issuing of all money, whether paper or metal, in the republic (15 Sept. 1916). The income from national lands and forests was also ordered paid in gold; and this too went to back up the new paper issue. Over $10,000,000 gold was also obtained from uncultivated parts of great estates which had previously paid little or nothing in the way of either federal or state taxes. At the same time all the banks in the republic were placed under the strictest government supervision, and those which had not complied with the conditions laid down as to currency reserve were permitted to do business only through a government interventor, who was empowered to see to their liquidation. None of these banks could issue any specie without the consent of the government. At the same time the duties were divided into four classes; those payable in metal only; those payable in metal or the equivalent thereof in national paper currency of the new issue; those payable in the new paper issue; and those payable in the new issue or the equivalent thereof in the paper issues of Vera Cruz and the Constitutionalist Army. The new paper currency issue was distributed as follows: 80,000,000 one peso bills, 60,000,000 two peso bills, 75,000,000 five peso bills, 75,000,000 10 peso bills, 70,000,000 20 peso bills, 75,000,000 50 peso bills and 75,000,000 100 peso bills. This work of reorganization of the currency and finances of the nation was placed in the hands of a commission of five members, all of whom had had considerable experience in monetary matters, and who were required to report to the Treasury Department, under whose direction they were working. The principal banks of issue in Mexico had, 30 June 1911, the following paper currency in circulation: National Bank, $54,841,000; London and Mexico, $19,278,000; other banks, $42,535,000; total, $116,654,000. There were issued by the government, in 1910, 6,206,000 silver coins worth $2,927,000; 6,146,250 nickel coins valued at $307,-312; and 19,450,000 bronze coins worth $194,-500. In the fiscal year ending 30 June 1911 the consular fees were $1,163,341; the general stamp tax amounted to $15,271,000; the taxes on mining land to $1,934,000; on ores and metals, $2,365,000; tobacco, $2,760,000; alcohol, $870,000; cotton goods, $2,517,000; explosives, $5,334; direct taxes, $6,295,000; municipal taxes, $5,133,000; postal service, $4,775,000; telegraphs, $2,255,000; and lotteries, $1,255,000. During the same period the importations amounted to $47,500,000; the exportations to $435,000 and the port duties to $1,985,000, making a total income from foreign commerce of $48,985,000, exclusive of export duties. In 1918 the United States took from Mexico goods to the value of $140,800,000 and sent there goods to the value of $106,893,000, a total business of $247,694,000. Owing to the fact that the revolution of 1910 and succeeding years divided the country into several factions, each of which controlled its own section of country and was more interested in maintaining its ground than in furnishing statistics, such as the Mexican government put forth annually previous to 1912, definite information relative to the financial and other conditions of the country from 1913 to 1919 is not available, except in a general way; and even this covers only that part of the republic under the control of the Constitutionalist party, which was able, largely, to finance the administration through the sudden enormous increase of the oil interests of the republic and the rise in the price of oil itself on account of the European War. The finances of Mexico, which were in a deplorably bad condition in 1876, when Gen. Porfirio Díaz assumed the presidency for the first time, continued to steadily improve throughout his seven terms of office until, on his re-election for the eighth time in 1910, they had reached such a

position that the Mexican government had secured a solid standing in the money markets of the world. According to the report of the internal revenue tax office for the fiscal year 1917–18 the total revenue collected was $75,496,360, distributed as follows: Mining, $2,203,353; exportation of metals, $10,003,225; alcohol and other liquors, $4,047,532; textile fabrics and thread, $2,304,050; importation of wines and other beverages, $2,330,584; electric light and power, $800,743; telephones, $201,055; bottled liquors, $900,164; matches, $286,842; advertising, $93,638; pulque, $479,295; petroleum, $7,955,113; patents, $23,449; inheritance tax, $357,577; loans, $92,301; federal taxes, $27,545,390; stamp document tax, $14,376,216. The public debt of Mexico, which has never been large for the potentialities of the nation, began with a 5 per cent loan of £3,200,000 contracted in England in 1824, which was increased by a like amount at 6 per cent the following year. The interest on these two loans was not paid from 1827 to 1831; and even after this latter date it was met only intermittently and was, therefore, the cause of many disagreeable complications which have become part of the history of the Mexican national debt, which itself became mixed up with political events of primary importance. In 1886 these two first foreign debts of the Mexican nation were consolidated with the national debt. Previous to this, however, they and other loans contracted in 1831 were consolidated into one national debt of £9,247,387, in 1837; and this agreement was again ratified in 1839. In 1846, the whole Mexican foreign debt, including interest due and unpaid, together with certain internal bonds and other unfunded liabilities, were again consolidated into one national debt of £10,241,650 in bonds of the 1846 issue, for the payment of which one-fifth of the customs receipts of the ports of Vera Cruz and Tampico, the duty on tobacco in all forms and the silver export duties on ore sent out by way of the Pacific ports were pledged. During the war with the United States the American forces seized and retained Vera Cruz and Tampico and the Mexican government was thus unable to meet its foreign obligations. In 1850 another attempt was made to meet the foreign indebtedness of the nation through its conversion into new bonds bearing 3 per cent and guaranteed by 25 per cent import duties and 5 per cent of the Gulf ports and 75 per cent of the Pacific ports duties, which were to be employed for the payment of interest on the bonds and their redemption. In 1864, by a decree of the imperial government of Maximilian, government stock to the amount of £4,864,800 was issued and was accepted by the original bondholders in payment of arrears of interest. The same year the imperial government secured a second loan of £12,365,000 in Paris and London; and this loan was practically all converted into the Mexican Imperial Lottery Loan with a face value of £20,000,000. Both these transactions were repudiated by the Republican party on the overthrow of the empire in 1867. However, a part of the debt of the empire was subsequently recognized during the Díaz administration. In 1888 a 6 per cent loan of £10,500,000 was contracted in London, Berlin and Amsterdam, 20 per cent of the export and import duties and all the direct taxes on industries and landed property and buildings in the Federal District being pledged to meet the obligation thus contracted. The following year the Tehuantepec 5 per cent railway loan of £2,700,000 was made in London and Berlin and a year later silver currency bonds to the amount of $6,700,000, bearing interest at 6 per cent, were disposed of in London and Amsterdam to meet certain pressing obligations for railway concessions and construction; and the same year another loan of £6,000,000 was made in London, Berlin and Amsterdam for the same purpose. Three years later a 6 per cent loan of £3,000,000, secured by 12 per cent of the import and export duties, was contracted in London. In 1894 the government created the 5 per cent Interior Redeemable Debt, with a view to a single new issue in which all future subventions to railways should be paid. This debt consisted of five series of $20,000,000 each. In 1899 the 5 per cent Internal Consolidated Gold Loan of £22,700,000, redeemable not later than 46 years, was issued to convert the 1888, 1890, 1893 6 per cent loans and 1889 5 per cent Railway Loan. In 1903 the federal government assumed obligation to the extent of £2,400,00 for the payment of the City of Mexico 5 per cent drainage loan, to meet the expenses of the drainage of the capital. The following year a 4 per cent gold bond issue of $40,000,000 was made in London, New York and Amsterdam, partially through banks and partially privately, to meet various pressing obligations of the government. In 1910 the final loan of the Díaz government was made at 4 per cent for £22,200,000, with a view to the conversion of the 5 per cent loan of 1899. Finally, in 1913, a loan of $200,000,000 was authorized, of which $60,000,000 was placed in France, with a guarantee of certain export and import duties. In June 1910, the public debt of Mexico was $300,524,996 (Mexican silver) payable in gold, and $137,850,133 payable in Mexican silver, and an additional debt of $273,398 (Mexican currency), making a total of $438,648,528 in Mexican silver. In 1918 the public debt was over 500,000,000 pesos gold (including interest of about 70,000,000 pesos), the gold peso being nominally worth 49.846 cents. Consult Conant, C. A., 'The Banking System of Mexico' (Washington 1910) and works under section on MANUFACTURES. On the same date there were in Mexico 33 banks, 25 of which were banks of issue; all of which were then doing business on a gold basis which had been introduced into Mexico in 1905 on the basis of a 50 cent dollar. For the fiscal year ending 30 June 1913 the revenue of the Mexican government was $120,958,902 Mexican currency against an expenditure of $110,781,871, a very considerable increase having taken place in five years, when the revenue was only $98,775,510 and the expenditure $92,967,393. It is worthy of note that, even with the revolutionary activity then prevailing, the revenue of the government was, in 1912–13, $15,755,816 greater than that of the preceding year. This income had reached over $150,000,000 (pesos) in 1917. This federal revenue is, for the most part, derived from stamp taxes, direct taxes and import and export duties. Although the finances of the Constitutionalist government had improved consider-

ably in 1919, yet the disorganized condition of the country and of many of the banks, both state and federal, and the loss of credit brought about by the long revolutionary period, made the task of the Constitutionalist party of straightening out the financial affairs of the country very difficult. Money was badly needed; and this the great money centres seemed unwilling to advance until greater opportunities for the exploitation of Mexico's natural resources were granted them. Working under this handicap, the government steadily pursued its ends with as much success as could be well expected under the circumstances.

8. **GOVERNMENT.** The constitution of Mexico is based upon that of the United States which it very much resembles. The republic is formed of free and sovereign states which, for administrative matters concerning the interests of the nation as a whole, are united under a federal government. In virtue of the constitution of 5 Feb. 1857 the national power resides in the people, who are the source of all public authority. The administration of the affairs of the country is carried on by the national government, for the federation, and by each state government for its own state. But no state law may conflict with the general good as expressed by the laws of the federation. Slavery is prohibited by the constitution and all persons born in the republic are free and equal in the eyes of the law, and every one has a right to freedom of thought, profession and occupation. In so far as it is consistent with private rights and the exigencies of state, the press is free. In Mexico one may publish what he pleases, for there is no press censorship; but the citizen and the government are protected by libel laws. Newspaper, magazine and other presses cannot now, as formerly, be confiscated as instruments of crime. The right to associate together for any lawful undertaking, business or enterprise, and the complete individuality of every law-abiding citizen of the republic or resident therein are recognized and all may leave or enter the country without passport. Mexico being a republic, hereditary honors and titles of nobility are not recognized and no one is permitted to accept or wear them unless by special act of Congress. Arms may be carried for lawful personal defense in certain parts of the country, whereas in others a permit to do so must be obtained; for the law recognizes that in mining camps, wild mountainous regions and unsettled parts of the republic, arms are necessary for self-protection, and here a permit is not exacted. Search without warrant is prohibited, and a policeman may not enter a private house without authorization from the police court, unless it be in pursuit of a well-known criminal or one caught in the act of breaking the law. Privileged tribunals such as were customary during the Spanish occupation of the country are strictly prohibited; and every man, be he priest or layman, citizen or administrative officer of the government, is ruled and governed by one common law. The passage of laws contrary to the interests of the nation is prohibited, and no treaties can be made with foreign countries for the extradition of political offenders. According to the constitution and the law of the land offenses against law and order are divided into two great classes, civil and criminal. No one may be imprisoned for offenses coming under the first of these heads. This provision includes debts and other monetary obligations, provided there is nothing criminal about their contraction. A person once arrested must be brought to trial within three days and just cause shown for his detention, or he must be set free. Whipping, torture, mutilation and other punishments of a like nature, common enough in previous periods of the history of the country, are declared contrary to law. All punishments except those of a correctional nature must be administered by judges of the criminal courts. The death penalty is practically never exacted in Mexico in times of peace. It is stipulated in the constitution, however, that it may be applied in cases of high treason, premeditated murder, parricide and highway robberies; but never for political offenses, except in time of war. In practice, however, about the only cases in which it is exacted, in normal times, are those of offenses of a most serious nature against military authority. In all legal actions one may appeal from a lower to a higher court until the Supreme Court of the nation is reached and gives its decision, which is final. But in cases of the death penalty, an appeal may be made to the clemency of the President of the republic. Once a man has been tried and acquitted he cannot be tried again for the same offense. In conformity with the principles of democratic government no spying upon the privacy of the people of the land is permitted and, on the same principle, all private correspondence is declared inviolable. The quartering of soldiers upon private individuals in time of peace is prohibited, and even in time of war it can be done only in conformity with certain regulations of Congress and through special orders issued to fit the exigencies of the occasion. Patents may be issued for a certain stated time on inventions of use to mankind, although the constitution states that no monopolies shall exist in the country except such as the government may take to itself for the general good of the nation; as, for instance, the coinage of money and the control of the postal system. In the case of serious internal disorder of whatever character, which threatens the safety of state or government, the President has the right to suspend the constitutional guarantees; as he also has in the case of foreign invasion. But this can be done only with the consent of his cabinet and Congress, or of the congressional committee when the Congress is not in session.

All persons acquiring land in Mexico become by virtue of this acquisition Mexican citizens, unless they distinctly state in their deed of acquisition that they reserve their right to the citizenship of their native land. One of the radical changes of the Queretaro convention (31 Jan. 1917) is the provision that only Mexican citizens, by birth or naturalization, may acquire landed properties or water rights or obtain concessions to exploit mines or combustibles; but the state may concede such right to foreigners who appear before the Secretary of Foreign Relations and agree to be considered as Mexicans, in so far as the titles involved are concerned and agree not to invoke, in regard to the same, the protection of their respective governments, under penalty, for violation of these provisions, of losing the titles

thus acquired, which automatically revert to the nation. All Mexican citizens, whether native born or naturalized, are liable to military service. All persons resident within the republic are guaranteed the protection of the laws of the land.

The state government is divided into three branches, executive, legislative and judicial. The chamber of deputies and the senate, constituting the Congress of the union, are the legislative bodies, and by them alone can laws for the government of the country be enacted. Two sessions of Congress are held each year. The first, which begins on the first day of April, lasts from two to two and a half months, and its primary business is to audit all accounts of the previous year and to arrange the estimates for the incoming fiscal year. The second, which begins on 16 September, lasts for from three to four months. The law provides for the election of a President of the republic who shall serve for a term of four years and shall not be re-elected, and a Cabinet composed of the following departments: Fomento (promotion), foreign affairs, interior, justice, finance, communications and public works and war and marine. The Constitutional party, recognizing that the constitution of 1857, with the various amendments thereto, was unsuited, in certain important respects, to the conditions under which the Mexican people live, decided to make such changes in it as seemed necessary for the welfare of the nation. To this end a convention was held in Queretaro (December 1916). After two months' deliberation it closed its labors on 31 Jan. 1917, having reformed, in a radical manner, a number of the most important sections of the basic constitution. According to these changes the office of Vice-President of the nation is done away with and the filling of that of President, in case of the death or absence of the chief executive of the nation, is left in the hands of Congress. The age of compulsory primary education is raised to 15 years and all parents or guardians are under obligation to see to it that their children or wards receive primary, secondary and military education. Instruction in all government schools and in all primary private schools must be laic, and no ministers, priests or officials of religious organizations or societies may establish or own schools or teach in Mexican schools. This abolishes the church schools which, before the revolution of 1910, ministered to fully two-fifths of the educational needs of the country. To make up the deficiencies in educational facilities thus caused the new reforms in the constitution declare it obligatory upon all agricultural, mining and industrial companies, resident outside of towns, to establish and maintain schools for the education of the children of the people in their employ or resident on their property. All schools, whether official or private, must submit to official inspection and follow the government program of studies.

The constitutional amendments of 31 Jan. 1917 provide for the subdivision of large landed estates, aiming in this way to solve the land problem, which formed one of the causes of the revolution of 1910. Each state or territory is empowered to fix the largest amount of land which any person or company may hold, and all landed properties in excess of this amount must be subdivided and sold off within a certain stated time, and in accordance with official regulations, otherwise they are subject to confiscation. One of these conditions provides that at least 20 years shall be allowed the purchaser in which to acquire property rights by making stated yearly payments. During this time no mortgage can be placed on the property thus acquired and the interest charged cannot be greater than 5 per cent. No lien of any kind can be placed upon homestead properties nor can they be seized for debt or other causes. In theory all land, minerals and other resources of the country are the property of the nation, and this position is maintained by the constitutional amendments of 1917, and the theory itself is put forward as a justification for the subdivision, by order of the legislature, of large landed estates and the national control of oil, mineral and water rights, with a view to the more equal distribution of the wealth of the nation and the encouragement of small landed proprietors. To hold mining properties it is necessary to work them; and no company may acquire and retain possession of more land than is actually necessary for the carrying on successfully of the business of the concern, whether it be mining, agricultural or industrial.

As the Constitutionalist party, when it rose in arms against the Díaz government, proclaimed the rights of the Mexican people to govern themselves in a direct and democratic manner and demanded the immediate solution of the agricultural questions facing the nation, proclaiming, at the same time, the rights of the masses, naturally these reforms find a prominent place in the changes made in the constitution by the convention of 1917. These are radical and far-reaching. The new labor laws provide for an eight-hour day with six days' labor a week; while night work is restricted to seven hours and when it is of a dangerous and unhealthy character, it is altogether prohibited for women and children under 16 years of age, while children under 12 may not be employed in any contract work. Commercial establishments may not work their employees after 10 P.M.; and children between 12 and 16 must not be worked for more than six hours a day. Women shall not be required to do hard labor for three months before childbirth and they may not work for one month after, but they shall be paid for this month and they shall retain their positions and all the rights of their contracts. They shall also be allowed two rest periods each day during the time they are nursing. The minimum salary in every district of the country shall be such as to provide for the necessities of life, the education of children and honest amusements. In all farming, commercial, manufacturing and mining enterprises the employees have the right to participate in the profits of the business, and the percentage of such participation shall be fixed, in each community, by a commission acting under the central commission of conciliation which, by law, is established in each state. There shall be no distinction in salary by reason of sex or nationality, for the same work. Farming, mining and industrial companies must provide, outside the cities and larger towns, proper sanitary dwellings, markets, hospitals and other conveniences

necessary to the life of the community, and when the employees number 200 municipal buildings and recreation grounds shall be provided within which no intoxicating liquors shall be sold nor gambling permitted. Employees may lawfully form combinations to protect their interests and the right to strike and to close down is recognized. The workmen must, however, give 10 days' notice to the Commission of Conciliation and Arbitration before striking, and they are not allowed to use violence of any kind in the attempt to enforce their demands. An exception to this rule is, however, made in the case of government employees in ammunition factories, which are under the authority of the army and thus subject to military discipline. A complete close-down shall be legal only when the excess of production makes suspension of work necessary to maintain prices at a reasonable rate, but approval for such close-down must first be obtained from the Committee on Conciliation and Arbitration, which shall be formed of an equal number of representatives of capital and labor together with one additional member representing the government. Any employer refusing to submit his case to the commission or to abide by its decision forfeits all right to any contracts already made with his employees and becomes obligated to pay them three months' salary. Should the workmen refuse the offer of the commission their contracts automatically become void. An employer who discharges an employee because he has joined a union or taken part in a legal strike or without any just cause shall be obliged, at the option of the workman, to pay three months' salary or to continue the contract. The law provides for free municipal employment bureaus and stipulates that, when a Mexican workman contracts to go to work outside Mexico, the contract thus made must be approved by the municipal authorities and viséed by the consul of the country to which he is about to go, and one of its provisions shall be that the employer must provide the means for the return of the workman to his native land. No part of a salary may be retained as a fine, as was formerly the case; no salaries may be paid in a saloon or place of amusement, and no workman may renounce his rights to indemnity for accident. No labor contract can be for more than one year, and in such contracts the laborer cannot renounce any of the rights guaranteed him by law. The only redress for the violation of a contract on the part of the employer or employee is a civil action.

Consult Coronado, M., 'Elementos de derecho constitucional mexicano' (2d ed., Guadalajara 1899); Dodd, W. E., 'Modern Constitutions' (Chicago 1909); Gamboa, J. M., 'Leyes constitucionales de México durante el siglo XIX' (Mexico 1901); Granados, R. García, 'La constitución de 1857 y las leyes de reforma en México' (Mexico 1906); *Pan-American Bulletin* (issues of 1917–19, Washington, D. C.); Wheless, J., 'Compendium of the Laws of Mexico' (2 vols., Saint Louis 1910).

9. ARMY AND NAVY. Owing to the many revolutions and upheavals through which Mexico has passed since it became an independent country in 1821, the armed forces of the republic have been a constantly varying quantity. At the time of the collapse of the Maximilian empire in 1867 there were four great military centres, the north, the west, the centre, and the southeast. When Porfirio Díaz took the city of Mexico in 1867 he had under his command more men than he had in the whole military force of the republic in 1910, when he was faced with an uprising which was destined, in less than a year, to send him into exile from which he never returned. Juarez, who, on the death of Maximilian, was acknowledged everywhere as the legitimate ruler of Mexico, found one of his greatest problems in the reduction of the armed forces which he had inherited from the prolonged conflict against the French, the clericals and the Reactionary party. He proceeded to solve it by dismissing from service hundreds of soldiers and officers, many of whom, being unfitted for civic life and having no means of making a living, became a constant thorn in the already troubled side of the executive. Bandits roamed the country and made so bold as to even invade the capital itself. Robbers, on a less pretentious scale, were everywhere; and most of them had either been formed from or organized by the dismissed soldiers of the republic or the forces of the Reactionary party. Díaz faced the same condition of affairs when he came into power in 1876. But he was wiser in his day than Juárez had been in his, probably because he was a thorough soldier and understood the soldier's point of view. He saw, in the very restless element that had given the Indian President so much trouble, the raw material out of which to create a rampart against the lawlessness that had overrun the land. In the course of a few years he had organized out of this unpromising material the *rurales* (rural guard), which became as famous in Mexico as the Northwest Mounted Police is in Canada. These guardians of the peace, which were to be found in organized groups in the towns, cities and villages throughout the country, were military in every sense except that they were under the jurisdiction of the Department of the Interior (Gobernación) instead of that of War. However, in the last few months of the Diaz administration (1911), the *rurales* were placed under the jurisdiction of the War Department, for strictly military considerations. Throughout the trouble they remained, for the most part, faithful to the government, but becoming later on disorganized through the many political changes that followed one another in rapid succession, they were finally disbanded. Throughout his long term of office, which extended from 1876 to 1880 and from 1884 to 1911, General Diaz gradually reduced the military force of the republic and aimed at increasing its efficiency. In 1910 the standing army of the republic consisted of less than 1,000 commissioned officers of all grades and less than 25,000 non-commissioned officers and men. Thus the government, which had been lulled into fancied security, through the years of peace which had followed the assumption of the presidency by Díaz, found itself unprepared to deal with a revolution like that of Madero, which affected the greater part of the country. The peace standing of the Mexican army was, in 1914: Commissioned officers, 3,112; non-commissioned officers and men, 26,431. The expenses of the maintenance of the armed

forces of the republic, the garrisons, etc., was, in the fiscal year ending 30 June 1914, over $40,000,000 Mexican money, or more than one-third of the whole revenue of the republic. As this amount embraces only the forces of the de facto government, it is probable that nearly as much more was spent in the maintenance of the revolutionary forces then in the field against the former. On 30 June 1916, A. G. Garcia, Mexican inspector of consulates stationed in the United States, gave the strength of the Constitutionalist army as 175,000 officers and men, all of which he claimed were well armed and uniformed. Other authorities place the Constitutionalist forces at between 85,000 and 100,000. This is considerably above the authorized peace strength which is 43,967, commissioned officers, non-commissioned officers and men. During the Díaz régime many new barracks were built and many old ones were reorganized and made modern. A school of *Aspirantes* (officers in training) was opened at Tlalpam, in the Federal District a short distance from the capital for the military instruction of men in all branches of the service who could not afford to go through the longer and more thorough course given in the National Military School in Chapultepec. Owing to the part the pupils of this Tlalpam school took in the uprising under Generals Mondragón, Felix Díaz and Reyes in February 1913, it was closed. The West Point of Mexico, however, is the Chapultepec school, which occupies a part of the famous Chapultepec building, the official residence of the President of Mexico. There are generally in attendance about 300 students all being trained for officers in the Mexican army at the government expense. The school also offers an excellent post-graduate course in advanced engineering, topography, military jurisprudence, ordnance, military history, advanced military tactics and an extensive course in the geography of the country which, from the military point of view, is extremely difficult. The present Constitutionalist government, following in the footsteps of the Díaz administration, is attempting to educate the illiterate soldiers in the ranks of the army, or at least to teach them to read and write. According to the recent amendments to the Mexican constitution, service in the army is obligatory on every citizen of the republic, and in time of war the conscription covers from three to five years; but as a matter of fact only the lower classes are forced into the army. In time of peace the Mexican army now consists of 34 battalions of infantry, 18 regiments of cavalry, one regiment of horse artillery, two regiments of field artillery, one regiment of mountain guns, two battalions of garrison artillery and one battalion of engineers, each battalion consisting of four batteries. On mobilization each four-company battalion (including the engineers) forms a regiment of two battalions while the four-battalion regiments are raised to six battalions and the cavalry regiments to six squadrons.

Owing to the difficulty which the Constitutionalist government has met with in securing arms, the armament of the forces is of different kinds, including various Mauser models for the infantry, and Remington rifles of a date as far back as 1893, the Mauser carbine for the cavalry, and other arms of German and Japanese make. The field and horse artillery have Q. F. guns on the Schneider-Canat system; while the coast defense consists, in so far as it is modern, principally of guns of French make.

The Mexican Navy.— The navy consists of the gunboats *Vera Cruz, Zaragoza, Bravo, General Guerrero* and *Morelos*, and the transports *Progreso* and *Oaxaca*. The *Zaragoza* is 213 feet in length, has a displacement of 1,236 tons and a speed of 13 knots, is built of steel and its armament consists of six Canat guns, two Nordenfeldt rapid fire guns and two Hotchkiss revolving guns. The *Vera Cruz* is 200 feet in length, 1,000 tons displacement, has a speed of 16 knots and is built of steel. It has two Bethlehem rapid fire guns, 6 semi-automatic rapid fire guns and one Whitehead torpedo gun. The *Bravo* and *Morelos* are each 252 feet in length, have 2,500 horse power and a speed of 16 knots. They are built of steel, and each carries two Bethlehem rapid fire guns and six Schneider-Canat rapid-fire guns. The *Progreso* is 230 feet in length, has 1,585 tons displacement, a speed of 12 miles, is built of steel and will carry 250 tons of cargo and 600 men, with the usual complement of officers. The *Oaxaca* is 100 feet in length, its tonnage is 979, its speed 7 knots, and it is built of steel and will carry 300 tons of cargo, 200 cattle and 500 men. Reserves are provided for service in the army in case of war, which can, if needed, be made to swell the entire fighting force to almost 500,000 men.

10. EDUCATION. The early history of education in Mexico is particularly interesting. In 1529, the College of San Juan de Letran was established in the capital and threw its doors open to Spaniards and Indians alike. The first university was opened in 1553 by special permission of the King of Spain. In 1573 two colleges, San Gregorio and San Ildefonso, were opened; and two others and a divinity school were established a few years later. Thus seven institutions of higher education were in operation in Mexico before the close of the 16th century. It was not, however, until 1578 that the science of medicine was recognized as meriting a place among the branches of higher education, the first chair of medicine being established in that year. Twenty-one years later another medical professorship was founded, and in 1681 anatomy and surgery were added. The Royal College of Surgeons, established in the city of Mexico in 1768, still exists as the National School of Medicine, a name adopted in 1845. Its home is the building made famous as the residence of the Spanish Inquisition. The Mining College or School of Engineering, established in 1792, occupies an edifice built by the famous Spanish architect Manuel Tolsa, at a cost of $3,000,000, and is in a most flourishing condition. Although the Spanish conquerors of the Aztecs were largely inspired by avarice, cupidity and brutality in their treatment of them, they were sincerely devoted to the cause of higher education and contributed liberally from public revenues and private fortunes to its advancement. In the city of Mexico there was founded in 1551 by the Spanish Crown, the first university in North America, 200 years before the independency of the United States. The National

Academy of Art occupies a building on the site of which was the home of the first European school of the new world, a school for Indians. The first normal school for males and its companion school for females occupied historic buildings completed respectively in 1678 and 1648; the Jesuit College of San Ildefonso, erected in 1749 at a cost of $400,000, is now the home of the National Preparatory School (a part of the National University of Mexico). The National Library, with its more than 400,000 volumes, was formerly the Convent of San Augustin. The building in which is now located the National Museum dates back to 1731 and cost $1,000,000 and The College for Young Women now occupies a roomy structure completed in 1734 at a cost of $2,000,000. Thus are education and history closely intertwined in Mexico City. In 1824 Humboldt wrote: "No other city of the new continent, not excepting those of the United States, possesses scientific establishments so great and so solid as those of the capital of Mexico." In most of the states, schools for the care and instruction of orphans are maintained at the public expense; in these both sexes are given the advantage of a primary education. Boys are taught the ordinary trades, and girls are instructed in the various occupations pertaining to the sex. In these, as well as throughout the entire educational machinery of the republic, modern methods have been adopted, and system, progress, and thoroughness prevail. Everywhere there is manifested the deepest interest in the uplifting of the masses through the most effective of all agencies — education. When Gen. Porfirio Diaz was first elected President in 1876 there were only about 4,000 public schools in the entire republic. From the coming of the Spaniards the chief interest in education had been confined to the higher branches, to the establishment of seminaries, colleges and universities, and the primary or fundamental branches were neglected. Under Díaz there resulted a noteworthy increase of schools and attendance. In the period between 1876 and 1891 schools of all classes had increased from 4,250 to more than 10,000 and the total attendance from 160,000 to 649,771. The attendance of *mestizos* (half-breeds), from 16,000 to 235,000, and of Indians from about 8,000 to 170,000. In 1891 the entire cost of maintenance of the educational system was $4,068,200, which sum was paid by the federal and state governments, the average cost per capita being $5.63. In 1907, the number of primary schools supported by the federal or state governments was 9,710 and by municipalities, 2,230; total, 11,940; and the attendance was 776,622. There were 34 secondary and preparatory schools supported by the federal and state governments, with an attendance of 4,231; of which 3,793 were males and 438 females. The number of private schools during the same year was 2,499 with 152,917 pupils. In 1913–14, $13,926,000 was spent in education. In 1917 the total school population of the state was 972,600 with a total enrolment of over 700,000, for the teaching of which there were over 22,000 teachers. The number of public libraries in 1913 was 151; number of museums 45, of which 11 were archæological, seven scientific, eight natural history, one geological and metallurgical, five agricultural, one medical and anatomical, one industrial, two commercial and nine miscellaneous. There were 164 scientific and literary societies. A law was enacted in 1888, but not put into force until 1896, making elementary education compulsory and compelling the establishment and maintenance of at least one public school for every 4,000 inhabitants. Under the provisions of this law the advance in education and educational methods throughout the republic was rapid.

The National Library, which has a large and very convenient building and location in the capital, is a noteworthy institution. In its collection of more than 400,000 volumes are many rare books and manuscripts. Among these are works by early Spanish historians and scholars written before the art of printing was known. A very large proportion of the volumes in this library was originally the property of the church or of the priesthood and the books were confiscated by the government during the progress of the war of reform. Naturally many of them deal with religion, literature, language or history. Of similar character are most of the state libraries. While there are some 45 public museums in the republic many of which are quite extensive and all of which are exceedingly interesting and instructive, far greater importance attaches to the National Museum in the city of Mexico, than to all others combined. Although it has occupied its present quarters in the National Palace only since 1865, it was established in 1831, with the collections previously belonging to the Conservatory of Antiquities founded by Emperor Iturbide in 1822, and to the Royal University, to which Viceroy Bucareli y Ursula had in 1775 transferred the remnants of a most valuable collection of maps, hieroglyphs on skins, manuscripts, etc. These were consolidated under the name of the National Museum. Here the student of archæology, of ethnology or of any other department of the ancient history of the American continent, or of the peoples who have at different periods dwelt upon it, may find greater wealth of material for investigation and study than exists in any similar institution in the western world. While there are also a number of very important art collections in the principal state capitals, the National Gallery, in the city of Mexico, holds unquestioned preeminence. Of literary and scientific societies there are many in Mexico. Every considerable community is the home of one or more of these associations, some of which have been in existence many years.

The Revolutionary party of 1910 was unreservedly committed to the education of the masses; but the burden was unloaded upon the individual states and communities over which the federal government retained supervisory rights but with no central control. The Constitutional party has shown itself strongly opposed to church control of schools of any kind, whether public or private. In Mexico the city schools are fairly good, while those of the towns and villages and the country districts are very elementary and poor. This is due to lack of funds for the maintenance of public schools and the difficulty of getting capable teachers for the salaries paid. The plan of organization of the Mexican schools is more French than American. Primary instruction covers four years and the high school course two. Four

years of preparatory school duties lead to the university, which is much more academic in form than in the United States; so much so, in fact, that the work covered by the National University, as it is now constituted, was known, previous to 1913, as "the course of higher studies." But the Revolutionary party did away with the cabinet office of Minister of Public Instruction, giving to the arts department of the university its old name of the National Preparatory School and erecting the post-graduate school into a university. Whereas previous to this all education had been without charge, the new educational law exacts a fee of $5 a month in both the preparatory school and the university, with all their affiliated schools, like those of medicine, law, dentistry, engineering, etc. (17 Jan. 1916). For some years past the tendency of Mexican public education has been toward the practical at the expense of the academic; and this tendency has been accentuated by the changes recently made. Military instruction is made obligatory; French and English have been reduced from a three to a two-year course and much attention is paid to manual training. To the General Direction of Public Instruction of the Department of the Interior, re-established in 1914, is entrusted all educational matters pertaining to the Federation, which were originally handled by the Department of Public Instruction and Fine Arts. The General Direction of Fine Arts of the Department of Fomento (Promotion) has charge of all public libraries, national monuments, historical, archæological, artistic and other remains; the National University, preparatory, normal and primary instruction, including the teaching of agriculture, commerce, industry, geology and manual training in the Federal District and in the territories. Rudimentary education and state colleges and schools are in the hands of the local authorities which have their own governing bodies for this purpose. All companies having charters from either the federal or state authorities are, by virtue of this concession, obligated to provide schools and teachers for the children of the people in their employ. The same law applies to plantations, ranches and agricultural enterprises in general. This new law has worked fairly well and has been instrumental in increasing largely the number of schools throughout the republic. In the state of Yucatán alone there were, in 1917, nearly as many school buildings as there were in all the republic in 1876. In others of the states under the control of the Constitutionalist party, the number had, in 1917, been doubled since 1910.

The National Preparatory School in Mexico City (the old arts department of the National University) is now, what its name indicates, purely a school to prepare pupils to enter upon the study of some one of the professions. It is a little higher than an American college and considerably less than an American university. The National University includes the School of Higher Studies and the institutions of law, medicine, engineering and odontology. It is governed by a university council at the head of which is the rector. Owing to the unsettled condition of the country due to the revolution, definite educational statistics are not available for the past six years; but the general reports issued by the Constitutional government show a steady increase in the efficiency of the public school system and an encouraging decrease in illiteracy in about two-thirds of the states of the union. More and better trained teachers, however, are urgently needed to carry on the work of general national instruction and the fight against illiteracy now under way. For the battle is an uphill one; for the illiterate still count about 70 per cent of the total population of the country.

11. **RELIGION.** There is complete separation of church and state in Mexico (since 1873); and the reforms made in the constitution in 1917 reaffirm with great emphasis the fact that the church, of whatever creed or denomination, is constantly under the most strict government inspection and that all ecclesiastical buildings, lands and other property belonging to the nation, which extends their use to the church. So, therefore, no religious order or denomination can acquire land or other property or mortgages on the same. This prohibition extends to school and college buildings, asylums, charitable institutions and residences of ministers and priests and even to the property collected within the walls of the churches and other ecclesiastical buildings. Gifts of movable property may be made to the church; but even these at once automatically become the property of the nation. Every church or religious society occupying property must elect an official head to represent it before the government and to become responsible for the national property in its possession. All ministers of whatever creed must be Mexican by birth. The provisions of the reforms made in the Constitution in 1917 shut out of Mexican religious institutions fully 2,500 Spanish priests of the Catholic Church alone, hundreds of French priests, employed principally in schools and colleges, and the Protestant ministers, mostly American, who had established numerous churches and operated many schools throughout the land. While all religions not inimical to the interests of good government and the laws of the land are allowed to exist and to exercise their functions in Mexico, yet all public religious observances and ceremonies must be carried on within the church property and are subject to official inspection and regulation. The law does not recognize the personality of any sect. The legislature of each state is empowered to regulate the maximum number of churches and ministers within the state. No minister shall have the right to vote, to hold any public office or to be voted for, nor is he permitted to take part, in any way, in public affairs. The establishment of monasteries and nunneries and the taking of monastic vows are prohibited by the Constitution, which asserts that the state will not permit the fulfillment of any contract, pact or agreement the object of which is the curtailment, loss or irrevocable sacrifice of the liberty of man, whether for the purposes of work, education or religious vows. Marriage is a civil contract and no other marriage ceremony except the civil one is legal. Therefore there are generally two marriage ceremonies performed in Mexico, the civil one by a magistrate appointed for that purpose by the government, and a second by the priest or minister

of the Church of which the contracting parties are adherents.

12. **MYTHOLOGY.** Prior to the European occupation Mexico and Central America were inhabited by races possessing a long history and a semi-historical mythology, manifold in its ramifications and rich in its internal development. Within this mythology was the very heart of those nations and peoples, for round it clustered their social and political institutions and their industrial life. Though it differed with the different peoples, fundamentally it was everywhere similar. The same thing had taken place in Mexico that had happened to the mythologies of the Indo-European races in Europe. Different tribes of the same great linguistic family had separated from one another and, in their migrations from place to place, during the more or less nomadic stages of their existence, they had, later on, come together again. During these wanderings they had forgotten one another and when they met again it was as alien peoples. Yet so similar were their institutions, languages, religious beliefs and the general course of their existence that they frequently blended and became more or less one people. This happened to the remnant of the Toltecs left on the upland plateaux of Mexico after the overthrow of their empire; to the Chichimecas and to the various other tribes forming the Aztec Empire at the time of the Conquest.

After their long migrations from their primitive home, migrations which covered centuries, the Nahuatl races met as strangers in the valley of Mexico and surrounding country. The blending to which we have just referred was imperfect. Thus among the Toltecs we find the deity to whom most deference was paid was Quetzalcoatl; among the Aztecs it was Huitzilopochtli, god of war; among the Texcocans, Tezcatlipoca, god of the air; among the Tlaxcalans, Camaxtli; among the Otomí, Mixcoatl, god of the chase. Like the Romans, the Greeks and many other civilized peoples of pre-Christian times, the Mexicans were accustomed to adopt the gods of other races with whom they came into contact, more especially if the mythology of these races was closely related to their own. The natural result was the very curious mingling of mythologies. Huitzilopochtli, Quetzalcoatl and Tezcatlipoca were all gods of the air, and they have so many characteristics in common there is little doubt they were originally one tribal divinity common to all the people who spoke the Nahuatl tongue at a time prior to the separation of the tribes. In fact, in Mexican mythology, these three gods are represented as brothers, and in every part of the Aztec Empire where Nahuatl was spoken they were the foremost divinities. In Tenochtitlán (Mexico City), where Huitzilopochtli was all powerful, in his great temple, a statue and an altar had been erected to Quetzalcoatl. At Cholula, the heart of the Aztec empire, stood the greatest of the pyramids of Mexico, with its famous shrine, both erected to the worship of the Feathered-Serpent god of the Toltecs. But its worshippers were not confined to the remnants of the Toltecs who had become incorporated into the Mexican nation. Peoples of various races, Aztecs, Colhuas, Zapotecas, Mixtecas, traveled from the furthest confines of the empire and from beyond it to pay their devotions at the shrine of this once powerful divinity. Yet in Cholula, where the cult of Quetzalcoatl was all powerful, Huitzilopochtli also held a place by the side of the Toltec god himself.

In Texcoco, the reputed centre of the advanced culture of the Mexican Empire, while Tezcatlipoca occupied the place of most importance in the native pantheon, just below him stood Quetzalcoatl and Huitzilopochtli. As the superior culture, refinement and intelligence of the Texcocans gradually came to exert an all-powerful influence over the rest of the Aztec Empire, their chief divinity, little by little, gained more importance in the Nahuatl pantheon, until at last he secured recognition which gave him, among the nobles and cultured class at least, a standing above that of the other tribal gods.

Gods of the Air.— To understand the curious relationship of these Mexican divinities it is necessary to remember that they were all gods of the air and that they had, in general, common functions, attributes and powers. Camaxtli, the war god of the Tlaxcalans, was recognized by the Mexicans as being the equivalent of their own Huitzilopochtli, while the Tlaxcalans held that he was identical with Mixcoatl, the Otomí god of the chase. Among these three peoples this deity was designated by more or less the same insigniæ. But he also wore upon his face and body the colors of the morning star, as did also Quetzalcoatl; he carried the lightning dart, which proclaimed him god of war, and at the same time connected him with the divinities of the wind, the lightning and the thunder. Mixcoatl, who had two temples in Tenochitlán, also wore the symbols of the god of the air.

The same fate befell the mythology of Yucatan. Itzamná, the older culture god of the peninsula, was the popular culture hero of the Itzaes, the first of the historical races who overran Yucatán and the adjacent territory; while Kukulcán was the tribal god of the Mayas. Yet both divinities were recognized by the Mayas and the Itzaes; the shrines of both were to be found in the centres of the religious cult of the peninsula and to them came pilgrims from Chiapas, Guatemala and all southern Mexico, generally over well-paved stone roads which now lie buried in impenetrable forests.

The Kiches of Guatemala called their culture divinity Gucumatz, "Green Feathered Serpent," a name indicative of divine intelligence; and the Mixtecas, hundreds of miles away on the west coast of Mexico, named theirs Yucano, the "Bright Light," a term having practically the same significance. But everywhere in the south, as among the Toltecs and the Aztecs, the traditions and offices of this great intertribal divinity were the same. He was the god of the winds, the thunder and the lightning, of the morning star, of fire and of light, the apostle of culture, the patron of merchants, the inventor of language, literature and art, the special divinity of athletes and sportsmen, artisans and thieves. To him, under one name or other, was erected all that was beautiful in the builder's art. He was the terrestrial representative of the great sun sent to teach the people of the earth the arts and

sciences. He was the originator of the Toltec, Aztec, Kiche, Maya, Zapoteca and Mixteca calendars and systems of hieroglyphic writing, and he is credited with having given names to animals, plants, minerals, places and geographical divisions. He was the great physician and the inventor of medicine; music and poetry, too, were his gifts to humanity. In short, he was a universal culture god whose powers and benefactions were bounded only by the advancement in civilization and the breadth of imagination of each of the many tribes and nations unto whom tradition represents him as ministering.

Creation Myth.— The Nahuatls believed that before the creation of the universe there existed a region inhabited by the creator, Tonacatecutli (Ometecutli), and his consort, Tonacacihuatl (Omecihuatl), who had four sons, Tezcatlipoca, Huitzilopochtli, Quetzalcoatl and Yayauqui. When the youngest of these was 600 years old the gods appointed Quetzalcoatl and Huitzilopochtli as their representatives. The two executors created a fire and a demi-sun, and then two human beings, Oxomoco and his wife, Cipactonatl. To the man they gave the art of cultivating the ground and to the woman those of spinning, weaving and prophecy. They then created Mictlán Tecutli and his wife, Mictlán Cihuatl, Lord and Lady of Mictlán. They divided time into days, months and years; and below the shining residence of Tonaca Tecutli, in the 13th region, they created eight heavens, the first of which was inhabited by two stars, male and female; the second by Tetzahua Cihuatl (woman skeletons), whose business is said to have been to devour humanity at the end of the world. In the third heaven were men of all colors; in the fourth birds which descended to the earth. The fifth was the home and birthplace of fiery serpents, comets and falling stars; the sixth the dwelling place of the wind; the seventh that of dust, and the eighth that of the gods. Tlaloc and his consort, Chalchiutlicue, were also created as masters of the waters in the heavens above and upon the earth below. Tlaloc, in turn, created a great number of little servants, all of whom were known as Tlalocs, while he himself bore the title of Tlalocaltecutli, "Lord of the Tlalocs." His pigmy servants distributed the water wherever Tlaloc ordered them to, and sent it down upon the earth in the shape of rain, where it was again taken in charge by other little Tlalocs. Whenever one of these was unfortunate enough to break the jar in which he carried the water the crash of the fall produced thunder, and when a flying fragment hit some mortal, men said he had been struck by lightning.

The sun created by the gods went half way across the heavens and then returned upon its tracks or, according to another version, it rose only a short distance above the horizon and stopped there, and its rays were very feeble, consequently the earth was dimly lighted. Both it and the moon were accustomed to wander about the heavens; so Tezcatlipoca undertook to create a new sun, and there followed an era of sun-creation resulting in the making of four separate luminaries.

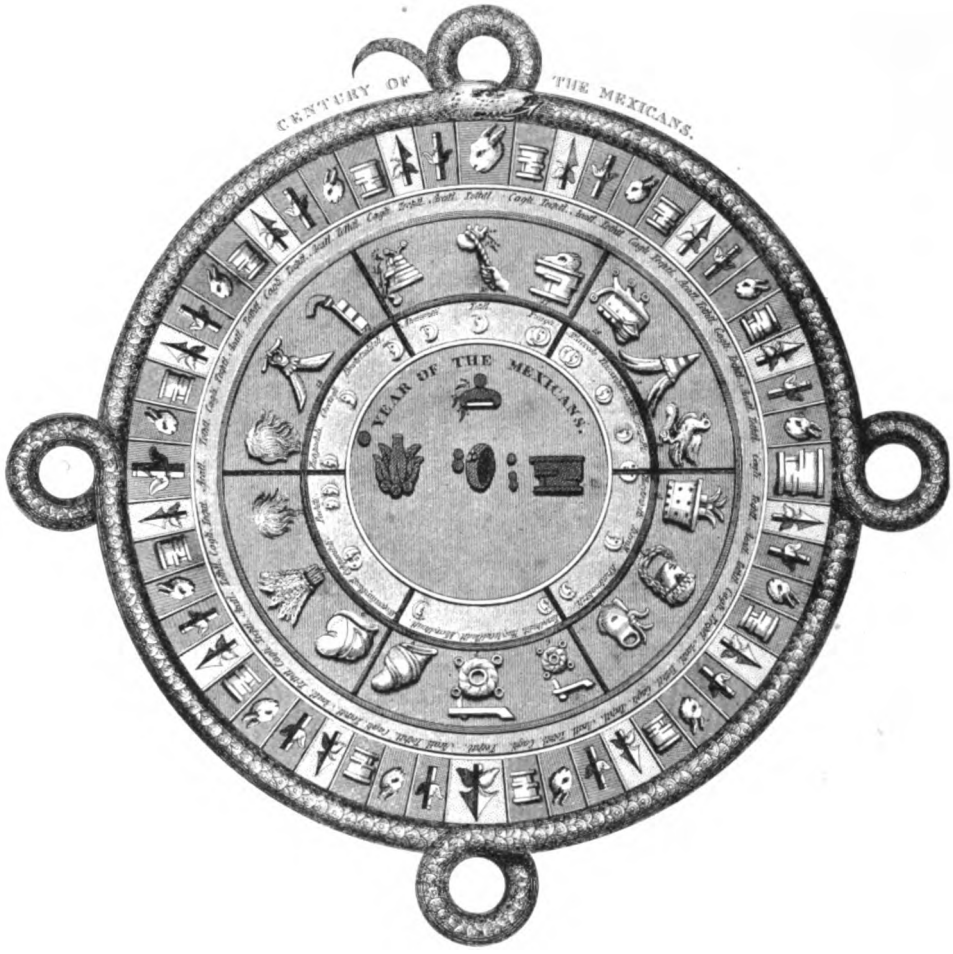
The Deluge.— There are different accounts of the creation of these suns and even the order in which they were created is disputed; but that their periods of existence represent four separate ages of the world is agreed by all. When the first sun, Atonatiuh ("water-sun"), was destroyed a great deluge descended upon the earth; when Ehecatonatiuh ("wind-sun"), met with a like fate, an all-devasating wind was created; and when Tletonatiuh ("fire-sun") ceased to exist, everything upon earth was destroyed by an all-consuming fire. Then followed Tlatonatiuh ("earth-sun"), who created all things as they now exist. Thus, according to Nahua tradition, the human race was swept from the earth three separate times, and people were in constant fear that a fourth destruction was to come, for they believed the four elements, earth, air, fire and water, were in constant conflict, and that for this reason they had already caused previous destructions of the world. After each of these destructions the earth had been repeopled by those who escaped. After the first inhabitants of the earth had disappeared, Coxcox and his wife, Teocipactli, escaped in a boat and landed on Mount Colhuacan. They were the progenitors of many children who were all dumb; but one day a bird, from the top of a tree, taught them to speak. They all spoke different languages, however. Hence the diversity of tongues.

Origin of Mankind.— According to one myth, after the destruction of the earth by fire, by Tezcatlipoca, Camaxtli-Huitzilopochtli sat upon a rock and, striking it with his wand, caused the first race — the Chichimeca-Otomi — to come forth and people the earth.

According to an Aztec myth, the first men emerged from a place called Chicomoztoc (Seven-Caves); and this mythological starting-point figures in all accounts of their wanderings. It was probably the place from which the seven tribes set out on their migrations southward, and at the end of which they arrived at the valley of Mexico.

Mexican Religion.— The Mexican had over 300 deities, some of whom had been borrowed from neighboring tribes and all of whom may properly be classed as nature gods. In addition to these they acknowledged a supreme being, whom they represented as the Lifegiver, Ipalnemoani, "He who gives us life," and Tloquenahuaque, the "All-embracing." This supreme being was never represented by picture or image and no sacrifices of any kind were offered to him. He was known as "Teotl," the god, and seems to have been identified with the Sun, and at times with Tezcatlipoca. The hieroglyphic by which he is represented is the same as that of the Sun. Tlacatecolotl, "Reasoning Owl," the enemy of the human race, seems to have been, in a sense, the force of evil opposed to Teotl.

The Aztecs and Nahuas in general believed in a life hereafter and that the souls of the dead went to one of three regions, the home of the Sun; Tlalocan, the residence of Tlaloc, the god of waters; and the dreary underworld called Mictlán, ruled over by Mictlantecutli and his consort, Mictlancihuatl. Soldiers killed in battle, prisoners sacrificed by the enemy and women who died in child-birth went to the home of the Sun, the men to wait upon him and to accompany him upon his daily journey to the zenith, where he was met by the women who formed his escort for the rest of the way. Those killed by drowning, lightning or any



One of the peculiar devices by which the ancient Mexicans computed time

of the diseases sent upon earth by Tlaloc or his consort, such as tumors and dropsy, and children sacrificed upon the altars of this god were transported, after death, to Tlalocán, a delightful region of mountains, shady trees and running streams. All those not qualified to go to the home of the Sun or the pleasure regions of Tlaloc were sent to Mictlán, situated, according to some authorities, in the cold and dreary north; according to others, in the gloomy "navel of the earth," where they were forced to lead an aimless existence.

By the Nahuas every phase of nature was personified and had its representative guardian spirit to whom offerings and sacrifices of some kind were made daily or periodically. Among these were household duties, of which every home had several, according to its class, condition and position in society. The sacrifices to the national and tribal gods were attended to by a numerous and opulent priesthood, who ruled in an autocratic manner and exacted heavy contributions for the maintenance of religious institutions and schools, the latter being also under their complete control. These sacrifices, generally slaves or captives taken in war, were offered up upon the stone altars of the temples, the victims being thrown upon their backs and held down by attendants while the officiating priest ripped open the breast and tore out the heart of each and offered it, first to the Sun, and then to the particular divinity to whom the sacrifice had been made. The presentation of fruits, flowers, grain, animals and birds to the family gods was generally made by the head of the family or of the community house, when a number of families lived in one large building, as was often the case in Mexico; while sacrifices were made by individuals to those divinities who were believed to work in the interest of individuals. Tezcatlipoca, a purely tribal divinity of the Texcocans, the most civilized and cultured of the Nahua people, had continued to gather to himself the powers of most of the other divinities, until, at the time of the Conquest, he was looked upon as a great divine ruler and creator and had become identified with the Toltec supreme divinity, the "Teotl." But he never ceased to be the tribal deity of the Texcocans. Huitzilopochtli, the tribal deity of the Aztecs, had become the great war-god of all the Nahuas because the military successes of the Aztecs had imposed him upon the other nations forming the confederacy. The large bodies of Toltecs who remained in Mexico after the fall of the Toltec empire formed communities, the principal of which was at Cholula, where the presiding deity was Quetzalcoatl, also the foremost divinity of the Zapotecas and, under the name of Yucano, that of the Mixtecas. The Toltecs who went southward carried the worship of this deity into Yucatan and parts of Chiapas, Tabasco and Campeche, where he disputed sovereignty with the older deities of the native races. In the long ages of mythology, hundreds of races surged to and fro across Mexico and the great isthmus of Central America, leaving behind them remnants of their languages, tribal customs and mythologies. Thus we have a mingling of tongues, creeds and customs which has sorely puzzled the antiquarian, the linguist and the student of mythology. The destruction of the native codexes and the undecipherable character of the remaining records in stone of the Mayas, Kiches and other highly civilized races of southern and eastern Mexico and Guatemala add greatly to the difficulties of understanding mythologies of the various races of Mexico.

Roughly speaking, the Nahua, Maya and Kiche deities may be classed as gods of the air, to whom belong the culture deities, the lightning, the thunder and the storm gods; the sun, the moon and the planet Venus (the Evening Star) and the Supreme Creator; gods of rain, mist, moisture and the running waters of the earth; grain and other plant deities; special patrons of trades, occupations, games, sports, learning of all kinds, including astronomy, astrology, witchcraft, luck in gaming, medicine and the healing art. The functions of many of these seem to be inextricably mingled and confused. This is due partly to our inexact knowledge of the past institutions, history and mythology of the various races who mingled and blended on this great bridge of the continents throughout unknown centuries before history began. But remains enough have been left to show the complicated nature of the religious system of the Nahuas and other cognate races and to prove that they had advanced to a stage wherein ethical considerations played a very considerable part. The prayers addressed to their gods, the speeches to the sovereign and other officials about to take office, the advice of a father to his son and a mother to her daughter; the poetical effusions of the royal poet of Texcoco, Nezahualcoyotl, and many other like documents which have come down to us, are filled with evidence of the high ethical plane of Nahua religious thought at the time of the Conquest; for every occupation of society, all reasoning, every movement of life had their separate being within the shadow of the Nahua religion.

MYTHOLOGICAL CHARACTERS.

In the following account of the more important mythological characters most frequently met with in literature relating to Mexico, the territory in which each plays his part is, unless otherwise stated, the land of the Nahuas.

Bacabs.— In the mythology of Yucatan the Bacabs, the upholders of the heavens, were supposed to have their stand at the four cardinal points. They were called Muluc, Cauac, Kan and Ix, North, South, East and West. They were probably related to the four wind deities and to the four rain Tlalocs. The Bacabs were frequently represented in Maya sculpture.

Bat-God.— The Bat-God, Zotzilaha Chimalman, the "Dweller in the Bat's House"; a primitive divinity of the Mayas, the Zapotecas and the Mixtecas is met with in the Popol-Vuh, under the name of Camazotzo, where he plays a prominent part in the adventures of the hero gods of the underworld. He seems to have been a god of volcanic fire and to have been closely associated with earthquakes and the lower regions.

Centeotl.— A family name given to the maize gods. The female divinity, called Chicomecohuatl, "Seven-serpent," represented water as a fertilizer and was assisted by Chalchiutlicue, the consort of Tlaloc, in fertilizing

the youngest harvest and looking after it. Under the title of Xilenon, "Green-corn-ear," she was the spirit of the green corn. As the earth goddess, she was called Tonacayohua, "She-who-nourishes." In this form she was one of the chief deities of the Totonacas, who erected to her, on the summit of a mountain, a great and imposing temple, to which pilgrims came from far and near. The name Centeotl was also given as a special title to both male and female deities. A summer festival lasting 18 days was held when the maize had attained its full growth. Ceremonial dances formed a part of this celebration at which a female called Xalaquia, who represented Chicomecohuatl, danced with the rest. Her face was painted yellow and red to represent the ripe corn. On the last night of the festival all the women and the head men of the community joined in the "dance of death"; after which the Xalaquia was offered up as a sacrifice to Chicomecohuatl. Not till the conclusion of this festival and its significant closing ceremony was it lawful to partake of the new corn.

Chac was the rain god of Yucatán. He is represented with a long tapir-like snout through which it was believed he blew the rain out over the earth. He corresponds to the Tlaloc of the Mexicans.

Chalchihuitlicue, "the rain goddess," wore a dress of nebulous green, a blue crown decorated with green feathers and a collar of precious stones to which was attached a golden pendant, all emblematic of the varying colors of the water. In her left hand she bore a conventional water-plant, and in her right a vase surmounted by a cross, the sign of the four directions or points from which the wind drove the rain.

Cihuapipiltin, "honored-women," the spirits of women who died in child-birth, were closely related to the Moon Goddess. The moon had two tendencies, one actively beneficent, the other actively malevolent. The Cihuapipiltin partook of this latter tendency. They afflicted infants with certain diseases and they entered the bodies of weakly people, more especially the insane who were popularly supposed to be governed constantly by their influence. Their temples were built at the cross-roads which they were said to haunt.

Citlapol, "the Great Star" (Venus), was the Lord of the Dawn, Tlahuizcalpan Tecutli. This astral deity was thought to influence the events of life very greatly, so whenever the planet was due to rise, the people stopped up their chimneys to prevent the entrance of its harm-bearing light; whenever it reappeared on its circuit, captives were sacrificed to its image or its representation painted upon a column called Ilhuicatlán, "Place in the Sky," erected in the courtyard of the great temple of Tenochtitlán. Owing to the very special importance attached to the movements of this planet by both Mexicans and Mayas, its periods of revolution were carefully watched and recorded with great accuracy. As the evening star, this deity was said to follow the sun on his journey to the underworld. He is represented as having a white body, symbolical of light, which was frequently covered with long, narrow, red stripes and over his eyes was a black mask, sometimes bordered with small white circles.

Coatlicue (Coatlatona), "She with Dress of Serpents," was the Aztec goddess of flowers and probably identical with the fabled mother of the god of war of the Aztecs. She was the patroness of gardeners who, in the early spring-time, offered her garlands of flowers.

Ehchuah, the "Black-God," was the patron divinity of merchants and cacao planters in Yucatán.

Gucumatz, "Green-feathered-serpent," the great Maya-Kiche culture deity, the equivalent of Quetzalcoatl, of which the name is a literal translation.

Huechaana, one of the two Zapoteca creation deities, was the creator of all men and fishes; Cozaana was the creator of all beasts. As the story relating to these two creator divinities is also told in another form by the Mixtecas, and as the eagle and the snake play a prominent part in this latter form of the myth, it is probable these two Zapoteca deities were closely related to the culture gods of other Mexican peoples.

Huehueteotl, "Oldest of the Gods," the fire deity, was also called Xiutecutli, "Lord of the Year," while he was generally addressed as "tata" or our father. He was represented with a black face and a red body, typical of fire. He wore a headdress of green feathers, a sign of royalty or divinity in pre-Columbian Mexico, and on his back he bore a yellow serpent, symbolical of his own special functions and of his relationship to the gods of the air. His connection with the sun, the father of all heat, was shown by a golden mirror. As Xiutecutli, he was a very much revered household god to whom an offering of drink and bread was made by every Mexican on rising in the morning. It was before his idol that the new fire was kindled every year. It was thought to be necessary for the existence of a new-born infant that a fire should be kept burning for four days in honor of its arrival and as a sign of gratitude to the Lord of the Year.

Huitzilopochtli (Mexilli), "Humming-bird's Feathers on the Left (leg)," the tribal deity of the Aztecs and their great god of war. He was the son of the Sun God and of Coatlicue (Coatlatona), "She with dress of serpent," the Aztec goddess of flowers and the reputed mother of the gods. He was born with a shield in one hand and a blue spear in the other, fully armed for war; and he proceeded at once to the extermination of his sister and his brothers, a fabled tribe of demi-gods, who had conspired to kill their mother. He pursued them four times around a mountain, killing many. Others were drowned in a near-by lake, while a few surrendered and made peace. Huitzilopochtli usually wore a headdress of humming-bird's feathers; in his left hand he carried a shield and in his right four darts. On account of his prowess in war and of the prominence of the Aztecs at the front of the Mexican confederacy, he was the religious head of the Mexican priesthood. He had power over all growing things; the feather markings of his shield were in the form of a cross composed of dots, thus connecting him with the Tlalocs; his face and his limbs were marked with stripes of blue, and he was seated on a pedestal of blue, at each of the four corners of which was a serpent. Across his face and his forehead, from ear to ear, was an azure band, all typical of his dominion over the sky.

where, as a tribal deity, he ruled as the god of lightning, of thunder and of terrifying winds.

Huistocihuatl was the protecting goddess of salt and salt-makers throughout the Aztec Empire, where the gathering of salt from the salt deposits along the low coast-lands was a business of great importance.

Hurakán, "He who hurls below," the Maya-Kiche god of the storm, of wind in motion, was accompanied in his work by violent manifestations of nature by three assistant deities, Cakulha-Hurakán (Lightning), Raxa-Cakulha (Lightning-track) and Chipi-Cakulha (Lightning-flash). Hurricane, Spanish huracán, is supposed to be derived from the name of this deity.

Itzamná, "Dew of clouds and heaven," father of gods and men, the tutelar divinity of Yucatán, and more especially of the Itzaes, was credited with possessing most of the powers of Quetzalcoatl, of ruling over more or less the same phase of human life and of performing more or less the same acts in behalf of humanity, and all evidence tends to show that he was but an earlier peninsular form of the great American culture myth. He was the universal life-giver and hence the patron divinity of birth and of growing vegetation. He was also the culture god who was popularly believed to have taught the Itzaes the civilization they had acquired. He was the fabled founder of Itzamal; and in his capital, in semi-historical times, was a magnificent temple dedicated to his worship.

Ixtlilton, "He of the Black Face," the god of medicine and healing, was also addressed as Tlatetecuin, the "earth-digger." He was said to be brother of Macuilxochitl. Sick children were carried to his temple to dance, and recite prayers and incantations, after which the priests gave them a special medicine contained in *tlilatl* "black-water jars." If the patient got better, the image of the god was taken to the house of his residence, where offerings and ceremonial dances were made in his honor.

Kinich-Ahau, "Lord of the Sun's Face," the Sun-god of Yucatán, presided over the North. He was also called Kinich-kakmo, "Sun-bird" and Arara, "Fire-bird." The figure of the Sun is frequently represented upon ancient buildings in Chiapas, Yucatán and Guatemala; and in the latter country certain Indian tribes still wear, on festive occasions, a gala dress with a great, yellow sun depicted on both front and back of the garment. They call themselves "Children of the Sun."

Kukulcán, "Feathered-serpent," a literal translation of Quetzalcoatl, was the great Maya culture god. He is said to have been the first king of Mayapán, just as tradition makes Quetzalcoatl one of the kings of Tula.

Macuilxochitl, "Five-flower," Xochipilli, "Source-of-flowers," was the patron of luck in gambling. His worship was general throughout the Aztec Empire and nations to the south of it; and he was held in high honor among the Zapotecas and Mixtecas. At a yearly festival dedicated to him, offerings of cakes, animals and human beings were made and ceremonial dances performed in which the people, richly dressed, took part.

Metztli, "the Moon goddess," Yohualticitl, "Lady of the night," was patroness of harvest and fertility. The Zapotecas and Nahuas believed that women stood in a very special relationship to this deity.

Mixcoatl, "Cloud-serpent," the Aztec and Otomi god of the chase, was sometimes represented as a deer or a rabbit. He carried a sheaf of arrows to typify his office. On the site of a famous ancient shrine of Mixcoatl stands Mixcoac, the "city of gardens," one of the most popular suburbs of the Mexican capital.

Nanahuatl, "Lord of lepers and those afflicted with skin diseases," is always connected with the moon, and diseased persons under his protection were believed to be sacrifices peculiarly acceptable to her, for whose service they were set apart. The moon goddess was intimately connected with the art of healing and she also took a special interest in lepers.

Napatecutli, "Four-times-lord," protector of mat-makers, one of the numerous rain gods, was one of the ministers of Tlaloc. He presided over the low, swampy lands where the reeds grow from which mats are still extensively made in Mexico.

Omactl, "Two-reeds," Nahua god of festivities and rejoicing, whose image always presided over the feasts of the well-to-do, was cermonially eaten in the form of a great bone of Indian corn meal at every festival. The idol had a recess in the region of the stomach into which provisions were put. The image wore a paper coronet and a cloak fringed with flowers and carried a sword.

Opochtli, "Left-handed," Aztec god of fishing, also called, in Chalco, Amimitl, was said to be the inventor of the fish-hook, line and spear and other means of catching fish. The similarity of his name with that of the Aztec god of war would seem to connect him with the latter, especially when it is remembered that Huitzilopochtli was the tribal god of the Aztecs when they were mainly fishers.

Sun-god, the supreme deity of the Toltecs, played an important part in the mythologies of the Nahuas, Itzaes, Mayas, Zapotecas, Mixtecas and other races of Mexico and Central America. He was called Ipalnemohuani, "He-by-whom-we-live." As the god of warriors the priest and nobles claimed descent from him. His golden image was hung upon the wall of his court where the first rays of the rising sun fell directly upon it. Human sacrifices were offered to the Sun, whose strength was sustained by the blood of these victims, otherwise he would not be able to continue his journey through the sky. Even the hearts of the captives offered to Huitzilopochtli and Tezcatlipoca were first presented to the sun. Some of the most magnificent temples of Mexico, Central America and Peru were erected to the Sun-god.

Tepeyollotl, "Heart-of-the-hills," personification of the echo of the mountains, was one of the nine attendants of the night and lord of the 13 days following the flood, in which no sacrifices were good, and during which the feast of the jaguar was held. He was a southern deity highly honored among the Zapotecas and the Mixtecas and bordering tribes.

Tezcatlipoca, "Fiery-mirror," the tribal deity of the Colhuas, was a god of the winds and the tempest and the giver of breath and hence of life. In the Nahua legend he is the

opponent of Quetzalcoatl whom he deceived and induced to give up his work upon earth and return to the home of the Sun. In the capacity of doomster he was called Yaotzin, "The enemy," and Nezahual pilli, "Hungry-chief." As the spirit of the ever-youthful tempest, he was address d as Telpochtli, "Youthful-warrior"; and as the spirit of the night, he was called Yoalli Ehecatl, "Night-wind." Benches were placed along the highway for him to rest on after his exertions of the night. He was a god of fortune and of fate. As the deity to whom worship was obligatory, he was known as Monenque, "Claimer-of-prayer" and as such he had special power over plague, famine and threatened danger to the people, the state and the human race. He had dominion over life and death. He carried a whistle, symbolical of the noise of the wind; as a warrior god he was armed with dart and shield. To his legs were fastened small bells and in his left hand he held a golden mirror, in which he saw reflected all that passed upon earth.

Tlaelquani, the Mexican deity whose province it was to forgive or eradicate sin possessed a dual nature. She was the patroness of desire and luxury; and the confessions made to her were restricted to sins against morality. She was mediator between the penitent and Texcatlipoca, the "Most Powerful God," the "Protector of All" and the "Searcher-out-of-evil." The penitent, in the presence of the officiating priest, lighted a sacrificial fire and burned incense to the deity to whom he confessed his sins and addressed his prayers for forgiveness.

Tlalocs.— The Tlalocs were masters of the liquid element in all its forms. In the dwelling place of the Tlalocatecutli and Chalchiutlicue, Lord and Mistress of the Tlalocs, there were four ponds of water, the first of which aided germination, the second of which withered the seed, the third of which froze it and the fourth of which ripened it. These two deities were, according to the myth, created after the appearance of the last sun. Tlalocatecutli was called the "Fertilizer of the earth," and the "Protector of Temporal Gods." He and his consort lived on a high mountain among the eternal clouds; and from there he sent his visitations of water, mist and fog. Hence his images were erected on high elevations such as hill tops and mountain summits. The characteristic sign of Tlaloc was the cross, which represented the four points of the heavens from which the winds drove the rains. The representation of Tlaloc in the Mexican manuscripts, is painted green and azure to depict the different shades of water; and he carries a spiral-shaped wand of gold, typical of the lightning.

Tlapotlazenan, the Aztec goddess of healing and the discoverer of turpentine as the base of certain native ointments, popular at the time of the Conquest, is credited with having originated most of the medicines in use throughout the Aztec Empire.

Uayayab, "He by whom the Year is Poisoned," was the Maya deity who presided over the five unlucky days at the end of the year. His image was carried out of every village and town and left outside during the days of his influence in order that he might not poison the new year.

Votán, the fabled civilizer of the ancient people of Chiapas, was closely related to the culture gods of the other races of Mexico and Central America.

Xipe was the god of vegetation and the sowing time and his general characteristics are those of the culture deities. He was considered a tribal equivalent of Tezcatlipoca and, under somewhat varying forms, he was worshipped throughout the Aztec Empire and among the nations bordering upon it to the south. He was connected with the Moon, and the gold and silversmiths regarded him as their tutelar god. He was called the "flayed-one," because at his festival the skin was removed from each human victim sacrificed to him and worn for 20 days by the devotee furnishing the sacrifice. In Tenochtitlán, where his festival was one of the important religious events of the year, he appears to have been looked upon as the god of human sacrifices. The monarchs and chief warriors of the Aztec Empire, when actively engaged in war, frequently donned the classical costume of Xipe.

Xolotl was a southern deity of lightning; and in the Aztec calendar he ruled over the 15th week and the 17th day sign; but as the Mexican calendar was borrowed from southern nations, and as the nature of this exotic deity was not understood by the Aztecs, he always remained to them a strange, mysterious figure. He was the Lightning Beast of the Mayas and cognate tribes, among whom he was a deity of the air and the cardinal points or the four directions of the winds.

Xpiyacoc and **Xmucane,** Father-and-Mother gods, are the Maya-Kiche equivalent of the Nahuatl generators, Ometecutli and Omecihuatl. They were endowed with creative power.

Yacatecutli, "He-who-guides," was the Mexican god of commerce and trade; and the Aztec merchants held in his honor, twice a year, great festivities during which elaborate banquets were held and sacrifices were offered to the god. The traveler's staff was his particular symbol, and to it prayers were made and offerings of flowers and incense proffered.

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13. ART. Pre-Columbian Art.— When Cortes first visited the shores of Mexico in 1519, he was surprised at the skill displayed by the Indian artists, who rapidly drew excellent sketches of his ships, his men, with their clothing, their arms and their horses, and forwarded them, by rapid courier service, to Montezuma in Tenochtitlán. This was the first contact of European and Mexican civilizations which was destined, in the near future, to produce the greatest and most characteristic of all the colonial art in the lands under the domination of Spain, during the 16th, 17th and 18th centuries, an art which is neither native American nor Spanish, but a mingling and blending of both in a way that has made it truly Mexican.

Mexican Indian art before the Spanish Conquest was mechanical, industrial, commercial and graphic. It was pictorial in the sense that all hieroglyphs and pictographs are pictorial; but it had not advanced beyond that stage in which it was still almost altogether a useful art. Mexican paintings, drawings and sculpture were the handmaidens of religion, commerce, trade, history, geography, literature and science; and so intimately were they all connected with one another that it is impossible to understand one without comprehending the others. Yet all had their influence upon the new art that sprang from the meeting of the two currents of thought, from the Old World and from the New.

The pre-Columbian inhabitants of Mexico were artistic in varying degrees; and the artistic sense still shows itself strongly in their descendants. Poets, orators, decorators, musicians, literary men, artists, penmen, all bring to their work a depth of feeling, a strong sensitiveness, often a strange vagueness, indicative of the artistic mind. The untutored, uncultured Mexican peasant produces pottery, artistic in form and decorated in pleasing colors and designs. He readily imitates the furniture imported from the best art centres of Europe and the United States; in many parts of the republic his weaving, his designs on woolen wraps and blankets and his pictorial featherwork are the delight of art collectors. This art sense creeps out in the most unexpected places. The rude Indian from the hills surprises us with the artistic way in which he has arranged the flowers he offers us for a few cents; he delights us with the baskets of his own manufacture on which he has depicted, in a really graphic manner, scenes from the national customs; with figures modeled in clay and painted in natural colors, depicting, in a most vivid manner, local types, customs, dress, trades, occupations, sports and pastimes. Generally the humble, diffident, barefooted, brown-faced figure, dressed in wide-cut, cotton pantaloons and shirt of the same material, who offers his wares for sale, is their creator; for there is little retail business among the Indian population of Mexico outside the towns and villages. All this points to an artistic past; for the condition of a given race at a given time is the result of its ethnic development.

Indian Feather-work.— The most characteristic of the pre-Columbian Mexican arts was the native feather-work, which called forth the admiration of the art lovers of Europe. The Mexican artists produced wonderful pictures by matching, with infinite patience and consummate skill, small particles of feathers, which they gummed to a background of woven fabric. An enthusiastic witness, bearing testimony shortly after the Conquest, says: "They (the Aztecs) painted in feathers, producing the living colors of nature"; and one can well believe this statement; for the untutored, ignorant Mexican Indian still handing down the traditions of his fathers imitates in feather mosaics national scenes, customs, occupations and sports, in so realistic a manner that, at a short distance, his work seems painted.

These feather artists were in all their glory at the time of the Conquest and they continued to flourish in Mexico for almost a century afterward. Their art was known to all the Nahuatl peoples; and centuries before the Norman Conquest of England, the Toltecs had developed it to such an extent that immense pieces of feather draperies representing mythological and other scenes were used as hangings with which to cover up completely the walls of certain apartments of the great temple at their capital, Tula, dedicated to Quetzalcoatl, god of the winds. Three different sections of the temple were decorated in this way, in each of which a distinctly different color effect had been produced. Feather tapestries were used as hangings for the palaces of the Aztec emperors and nobles; and they were, competent witnesses assert, the equal of the best woven or painted wall hangings made in Europe during the 16th century. With the boldness born of long practice and acquired skill, Mexican feather artists attempted successfully to produce in feathers the works of the most famous Italian and Spanish artists of the 16th century. The converted Indians "painted" in feather mosaics the favorite saints of the Catholic Church; and their work, which was encouraged by the papal authorities at Rome, became immensely popular in Europe.

The most brilliant plumage of the birds of the tropics were sought out with which to imitate the colors of nature. Shortly after the Conquest a Great Christian-Pagan feather mosaic was sent to Pope Paul III; and so excellent was its workmanship that his Holiness would not believe it had not been painted in oil until he had tested it by examining it closely and carefully. This work so impressed him that he expedited a bull, in 1537, rehabilitating the Indian races of Mexico, the greater part of whom had already been reduced to slavery in the 16 years that had elapsed since the Conquest.

Feather-work mosaics and other forms of ornamentation and decorative feather art entered into the very life of the Mexican people prior to the Conquest. All the land of the Aztecs was searched for artists who showed

special talent in this difficult and exacting kind of work. Children were trained from childhood in special schools of art and their masters were themselves the most skilled artists of the land. Picture-making was, however, but a part of their instruction. They were schooled in the art of making princely garments for the emperor, the princes, the nobles and the priests and the noble ladies of the court: so highly was the art esteemed that the sovereigns themselves considered it high honor to be classed as even passably good feather artists. Clazonzi, king of Michoacán, next to Texcoco, the greatest centre of feather-work, enjoyed the distinction of being the best artist in his kingdom; and he was inordinately proud of his skill, probably more so than of his royal honors.

The Feather Market.—The work of the feather artists developed a great commercial business for the Aztec merchants. The most highly appreciated feathers were bought and sold daily in the market, where they were so esteemed that they brought literally several times their weight in gold. They passed as currency among the Aztecs and neighboring nations; and nothing more valuable with which to pay the ransom of captured princes or conquered kingdoms existed than they. Captives who were good feather artists brought high prices in the market and, for this reason, their lives were spared from the sacrificial altar. Merchants devoted themselves especially to the buying and selling of art feathers; and the chief purchaser for the court held the title of purveyor of feathers to the sovereign. Men of fine artistic tastes were trained to sort feathers and to arrange them into classes according to their color, fineness, merit and market value. They held office under the government and were highly paid officials.

Throughout the Aztec Empire, very stringent laws protected the birds from which the most esteemed feathers were obtained for the work of the artist; and the quetzal, the most highly valued of these favored ones, grew into a sacred bird, and as such his feathers could be worn only by the king and the high priest, both of whom represented their gods upon earth. The Aztec monarchs maintained great aviaries in the capital where birds of rare plumage were reared with the greatest care; and the stealing of feathers from these royal aviaries was punished with death.

Centuries of training in art work of such an exacting nature as feather mosaics developed the artistic sense strongly in the artist caste of the Mexican people; and it is not at all strange that this ability began to show itself in a new way shortly after the Conquest, when Spanish friars and missionaries, many of them no mean artists themselves, began to teach the principles of European art to the pupils of the Mexican convents and schools, nearly all of whom belonged to the native nobility or to families dedicated to trade, to the arts, the crafts or to literature and music, all of which were held just a little lower than noble rank. The merchants who brought the precious feathers to the capital and distributed the manufactured product to the furthermost confines of the empire and to the countries beyond formed a guild unto themselves, over which presided Quetzalcoatl, the first half of whose name is formed from the "quetzal," the sacred bird and the symbol of divinity. It is still preserved upon the coat of arms of Guatemala. But the very enthusiasm with which the natives threw themselves into the new learning caused for the restraining hand of Spain, which gradually shut out from them almost every field of endeavor except that of painting, or so controlled the workmen that the Spaniards got the profits and the glory from every accomplishment.

Hispano-Indian School.—Echoes have come down of a school of Indian painters, who flourished during the first 50 years following the fall of Tenochtitlán, in Texcoco and Cuautitlán, both towns near the capital. Under the Spanish masters they had learned to paint the saints and to represent graphically biblical and religious legendary subjects. They painted the pieces of "escenario" necessary for the production of the miracle plays and other dramatic representations by means of which the Christian Church attempted to teach the natives the principles and dogmas of its faith. Little or none of the art of this period has survived with the exception of one picture of international fame which, on account of the material on which it is painted and the artist's treatment of his subject, almost certainly belongs to this early Ibero-Indian school. This is the famous picture of Our Lady of Guadalupe which made its appearance within eight years after the fall of the City of Mexico, or before 1530. The religious legend asserts that the picture of the patroness of the Mexican people was miraculously made by the tilma or shoulder-covering of a poor Indian named Juan Diego. Historical investigation has shown that it was painted for a miracle play given in one of the new convent schools in the City of Mexico very shortly after the Conquest. This picture shows very considerable artistic talent, which is neither Spanish nor Indian, but a blending of the two. The drawing is bold and free and the coloring anticipates, by three-quarters of a century, the soft, pleasing tone of the artists of the first great Mexican school.

The demands of the ever tireless, ever active church upon the Spanish-born and native artists alike were insistent and persistent and many hundreds of canvases belonging to the first three-quarters of a century following the Conquest were produced at the wave of the miraculous wand, for the churches, schools, convents, monasteries and episcopal palaces that sprang up, phantom-like, throughout the land. Spanish artists of note were brought from old Spain to superintend the work of the native artists in New Spain; and they attested the wonderful aptitude of their pupils.

Early Spanish Masters.—One of the earliest of these masters was Rodrigo de Gibur, who arrived in Mexico shortly after the Conquest. He appears to have had the patronage of the conqueror, Cortes, of whom he painted several portraits. The picture of the baptism of Magiscatzin in the church of San Francisco, Tlaxcala, is said to be his work. He also painted the portraits of the first audencia and also of Doña Marina, the Indian querida of Cortes, about 1536.

Andrés de Concha, who arrived in Mexico during the time of the first viceroy, and

Indian pupils enjoyed a high reputation as interior decorators of churches and convents and they were often called to interior cities to do decorative work. The group of paintings over the high altar of Santo Domingo Church in Yanhuitlán, Oaxaca, is the work of Concha, whom Padre Burgoaque calls the Apeles of the New World.

Arteaga, another master painter, is said to have reached Mexico City three years after the Conquest and to have been very active in building up the Indian school. There was one of his pictures, 'The Visitation of the Virgin,' in the old church of Santa Teresa about the middle of the 18th century; and it is probably still in existence.

Simón Pereyns, a Flemish artist, painted the pictures for the main altar of La Merced church, and a 'Virgin with a Child' in the National Academy is supposed to be his work. Francisco Zumaya and Francisco Morales were his contemporaries. Alonzo Vázquez, who was somewhat younger than Pereyns, was also active as an artist and a teacher. The 'Assumption' and the 'Redemption,' in the National Academy are credited to him. Juan de Rua, one of Vázquez' pupils, has left a fairly good series of scenes from the life of the Virgin, in the church of San Francisco, Cuautinchán, Puebla.

Pupils of these masters, also famous in their day, have come down to us. Bernal Díaz del Castillo, the first historian of the Conquest and one of the soldiers who took part in it, praises highly three Indian painters and lapidaries, Andrés de Aquino, Juan de la Cruz and El Crespillo whom he likens to the best artists of Italy and Spain in his day. Alonzo Vázquez and his pupil Juan de Rua, already mentioned, are credited with having introduced correct European methods of art into Mexico; and they and their school undoubtedly paved the way for the flourishing and excellent school of artists of the 17th century. In fact we know, by the results already obtained and by the reports that have come down to us, that there had been a wonderful quickening of life in all the arts between 1521 and 1600. This was but a re-echo of the animation in art in Spain herself, in Italy, in the Netherlands and throughout the vast Spanish empire in America. Industries, arts, trades, commerce, mining, agriculture took on a new existence, and Mexico City became the first metropolis of the New World, and the centre of this new-born progress in America. The genius of the Spaniard for organization laid its hand upon the immense domains of the Moctezumas and that hand was never lifted for 300 years, during all of which time the artistic life of the luxurious capital of New Spain was ever in touch with that of the mother country. With the coming of the first viceroy in 1535, his activity of the favorite colony increased. A year later printing was introduced into Mexico City; and the court of Spain began to take a peculiar interest in the educational and artistic development of her favorite colony. To this interest and the strong encouragement which accompanied it is due, in part at least, the eagerness with which the native artists worked. The hundreds of Spanish and Flemish paintings and the thousands of art prints that flooded the land, affording means of study and advancement not before possessed by the natives, made possible the successful school of native art with which the 17th century opened.

Influence of Spanish Art.— The discovery of America and the sudden vast treasures that poured into Spain from over seas, the long struggle with the Moors, of Christianity against Mohammedanism, the rise of the Catholic Church and the birth of the temporal power of the popes and the consequent wars necessary for the maintenance of the powers and conditions thereby engendered, were forces that worked inexorably to the shaping of all Spanish art, which had its origin in the Church and received its inspiration and encouragement constantly from the same source. Italy was the great mistress of Latin art and the teacher of Spain, when she came to lay by her Gothic traditions, but Spanish art traveled a road distinctly different from that of Italy. In Spain art was very largely influenced by the traditions and dogma of the Christian Church, which continued to shape it to its ends and control its execution. In Italy it was classical and it ran after strange gods which also shaped it to their ends. In Italy art was free, unrestrained, licentious the more orthodox Christians contended. In Spain it was bound by the canons of Church law, by the restrictions of ecclesiastical councils and by an intense fanaticism and a devotion to the Christine doctrine and legendary lore unknown in other countries. Upon it rested the heavy hand of asceticism and the sombre shadow of the Inquisition, a peculiarly Spanish institution. Yet the artists of Italy exercised an all-powerful influence upon those of Spain; for more than two centuries of changes varying always within a certain defined and restricted area of activity. The ascetic Spanish taste did not change its Gothic attitude, when under Italian influence it changed its fashion in painting. While the Italian gloried in the nude of Greek and Roman art, the asceticism of Spain covered up the parts of the human body, wrapping them about with draperies, too often much less artistic than the freer treatment of Italy. While the Italian artist boldly attempted to depict the human anatomy in all its nude or semi-nude and almost wholly Pagan attitudes, the Spanish artist was forced to resort to suggestion to convey lasting impressions of what his asceticism had forced him to hide from sight. Thus, while the Italian artist, by his free and unconventional use of the nude, obtained brilliant sculptural effects, the Spanish artist, in his efforts to reach the same ends, while draping his figures, became insensibly a colorist. So Murillo, the greatest of all Spanish colorists, has always been Spain's most popular artist.

It was therefore natural that, of all the Italian schools, the Venetian suited Spanish taste best; and of all the Venetian artists, Titian appealed most to the Spanish attitude of mind toward art. The brilliant coloring of the Venetians, their indistinct drawing and their neglect of the antique appealed to the religious ideas of the Spanish artists. So Titian became the motive spirit in the renaissance movement in Spanish art. A powerful but secondary influence was exercised by the Hollander, Antoine More, who, as a portrait painter, was little inferior to Titian. Vandyck also contributed to the making of Spanish art traditions. But the atmosphere of Spanish life

and the fervid religious spirit of the land twisted all the foreign traditions of art and of schools to their own way of thinking and of viewing life and of acknowledging its obligations, with the result that Spanish art grew to be a thing apart from its own Gothic traditions, from the classical style which it imported from Italy and the rigid Venetian school to which it very strongly inclined. The sombre, ardent, fanatical Spanish mind worked over all these materials and from the working sprang a new art which was peculiarly Spain's. For more than two centuries this strange semi-artistic, semi-ascetic spirit brooded over Spain, producing the magnificent creations of Vargas, Morales, Sanchez, Coello, Joannés, Becerra (the great teacher), Fernández el Mudo (the "Titian of Spain"), Cotán, Zubarán, Pereda, Velázques (the incomparable portrait painter) and Murillo, the superb master of color. And they all had, through their art which found its way across the Atlantic, their influence upon the artists of the colonies in America. Yet we look in vain in treatises on art for any adequate presentation of the work of the American artists or of the vast output of excellent painting by the Spanish colonies in America, all of whom followed the traditions of the mother country, modifying them more or less according to their several environments and local influences. Yet for more than two centuries, the followers of the Spanish masters in America, enthusiastic students of their creations, tireless workers, covered the two continents from San Francisco to Buenos Aires, from Cuba to Chile. In every provincial capital industrious schools of art existed; and all followed the traditions of Spain. At the exhortation of the Church and the insatiable demands of the dealers who made a business of shipping pictures over seas to the colonies, the Spanish artists at home redoubled their efforts; and a constant stream of canvases poured forth from their hives of art industry. No church, convent, college or university in the vast domains of Spain beyond the sea was so poor as not to possess at least one treasure from the art centres of the mother land. When the ecclesiastic dignitaries of Spain wished to show honor to some institution of the colonies, they forwarded to it a painting or other work of some noted Spanish artist. The king, the emperor and the nobles showed their favors in the same manner. New Spain, the favorite namesake of the mother land, became thus a storehouse of Spanish art. These treasures were to the Mexican artists what the pictures of Italy and Holland were to the artists of Spain. They copied them, they imitated them and they built upon them a Mexican art which, while it followed the traditions of the Spanish school, was yet, in many respects, distinctly Mexican, as the character of the Mexican people and their environments are distinct from those of Spain.

For more than 200 years the Spanish artist attended to only one of the manifestations of nature, that is, man and his relation to the deity and to heavenly manifestations. Mountains, streams, oceans, the sun, the moon, the beauty of the night and the glory of the day meant nothing to him except when they helped him to depict his deity, his saints, his religious traditions, his dogmas and his miracles. In all this the Mexican artist followed his masters, faithfully, conscientiously, earnestly. But the spirit with which he executed his tasks was noticeably different from that of his teachers. The stern, harsh character of the Spaniard is depicted in the hard lines of even the best of his artists up to the time he began to leave behind him the vivid memory of the terrific religious wars against the Moors. When the "heathen" of the New World had been conquered and placed beneath his heel and he had filled with churches, shrines and colleges their vast domain; when he had lifted from his shoulders the burden of strife in behalf of altar and hearth, then the Spanish artist began to cover up the harsh lines of Gothic and early Venetian art traditions and feelings, thus engendering an attitude of mind that made possible the wonderful analytical representations of Velázquez and the brilliant coloring and softening effects of Murillo.

But as the Indian character was different from that of the Spaniard, so long before Spain had deserted her ancient Gothic traditions completely, the Mexican artists had become noted for "the gentleness of their art." More than half a century before Murillo produced his best work, which marks the middle and last period in his progressive development, the old Mexican master, Beltásar de Echave, had painted characteristically native pictures which found their way to the foremost shrines of the country and to many of the Spanish colonies in America where, not infrequently, they were represented to be the work of noted Spanish artists. His reputation extended even to Spain where he was praised by the foremost painters of the day, a great distinction for a colonial artist, in an age when Spain was very jealous of all honors given outside her own peninsular domain. But greater honors have come to Mexican artists since Echave's day; for the works of her masters have been gathered in from all over the land and taken to Europe where they have been passed off as original works of Spanish masters of the 16th, 17th and 18th centuries. Thus Mexico has lost countless treasures of native art. Every revolution has helped to deplete her works of her greatest artists. The sacking of cities, the plundering of churches, convents and private houses, the rapacity of native owners of art treasures and foreign speculators and often the wanton ignorance of the revolutionary leaders have conspired to deprive her of the living record of her prominence in art over all the other nations of the American continent. Some of the revolutionary leaders have been accused of cutting from their gilded frames the great old canvases of the churches and convents and turning them with the paint side upward to serve as tents or shelters from the tropical sun for themselves and their brother officers. Valuable pictures of native and foreign artists were not unfrequently slashed with swords, knives or otherwise mutilated or destroyed. But the greatest injury done to native art was the result of the ignorance of the treasures possessed by the nation and the consequent neglect to care for it. Ancient pictures of merit were replaced by others of lesser value or historical interest by some local artist in vogue at the time and the dispossessed pictures were relegated to the garret where they were left to moulder in the damp and darkness and

to become worm-eaten. Guardians of the treasures of the church, tempted by cupidity, often sold their finest pictures, which not infrequently passed to foreign lands there to cease to be Mexican in name at least.

And yet no other country on the American continent continues to possess anything like the amount of really artistic pictures of its ancient artists as that still retained by Mexico. Lovers of art in Mexico have begun to recognize the high standard of excellence attained by their best masters of the 17th and 18th centuries; and the market value of these pictures has risen rapidly during the present century. But this is an added danger to the retention of the native art at home.

The School of Echave.— The founder of the first Mexican school was Beltásar de Echave, the elder, whose first existing picture dates back to 1601. He had already become a famous artist by 1609, years before Velázquez and Murillo flourished in Spain. His drawing and conceptions are very much better than anything produced by his contemporaries; his forms and faces are true to nature and his style is devoid of affectations and conceits. Other Mexican painters have surpassed Echave in execution, in perfection of style, in the observation of the technical laws of art, but none have approached him in fertility of invention and depth of thought. In fact he was philologist, critic and writer as well as artist. His wife, La Sumaya, who was also an artist of no mean merit, is said to have been his teacher in the art of painting; and a meritorious picture of San Sebastian in the cathedral is said to be from her brush. Echave and his wife both belonged to the Spanish school of Joannés, the best artist of his day and superior to all who preceded him in Spain. The work of Echave is unequal, but the best of it shows a genius superior even to that of his master, whose praise all Spain sang in his day. Though his style was finished and somewhat labored, like that of the artists of his epoch, yet his industry and application were so great that he left very many pictures varying from huge canvases to small tablets, which, before the amortization of church property, were to be found in many of the churches of the capital and in many of those in the interior. Among his existing pictures are 'San Cristobal' (1601), which stood over the great door of the Franciscan monastery, 'San Ignacio' (1610), and the 'Martyrdom of the Virgin of Colonia,' both of which were also in the same edifice; 'San Francisco de Paula,' in Guadalupe church; 'Martyrdom of Santa Catarina' (1640), in Santo Domingo, and 'Santa Cecilia,' one of his best, in the Profesa. In 1608 he painted 15 tablets for the altar of the old church of Santiago, Tlaltelolco.

Luis Juárez, a contemporary of Echave, shows, in all his works, strong individuality. His figures are excellent, his exposition strong and true, but his execution is frequently unequal. Many of the heads of his figures, to which he paid much attention, are as fine as anything produced by the Spanish masters of his day. Juárez' style is free and less labored than that of his master, Echave, to whom he is but slightly inferior. He was very prolific and this, coupled with his popularity, made his execution, like that of Echave, very unequal. However, his conception is always bold and his coloring good. His work is more realistic than that of Echave. Most of his known pictures are in the Mexican National Academy.

José Juárez, who was active from 1642 to 1698, followed the traditions of Echave and came the nearest of all the Mexican painters to attaining to the excellencies of his master, to whom he was but slightly inferior in expression and the depicting of religious feeling. He had exceptional talent but, owing to the speed with which he was forced to do the vast amount of work that came to him, he often became careless. Rafael Lucio, an excellent critic, says of Juárez: "I have seen angels of his that seemed to belong to the very best period of Italian art." His style is elevated and even more realistic than that of Luis Juárez; his drawing and execution are good, and in his grave and harmonious coloring there is a noble severity. His figures are free and flexible and show strong individuality, while his canvases are generally lit with the animation of life, partially due to his masterly grouping of figures, his excellent coloring and his decided tendency toward that softness and simplicity which distinguishes the school of Echave. There is a noted depth and contrast in his coloring. A number of his best pictures are in the Mexican National Academy.

Sebastian de Arteaga, a priest and notary for the Inquisition, was another excellent artist belonging to the school of Echave. He displays vigor, power, freedom of movement and a boldness unknown up to his time in the Mexican school. His style is less finished than that of his great contemporaries and his coloring is not so good; but his figures of the Virgin are graceful and beautiful. He is content, too often with carefully executing his central figures and leaving his accessories but poorly done. His style is truer to nature than that of the elder Echave but he lacks the grace of the old master and that simplicity which distinguishes the early Mexican painters. In his work there is a dash and a freedom with the brush that might have made of him a really great artist had he given his whole attention to art; but he had too many other occupations to permit him to work out his own salvation. In the Mexican National Academy there are three notable pictures of his: 'The Betrothal of the Virgin,' 'Saint Thomas Putting his Hand into the Wound of the Christ' and his 'Adoration of the Wise Men.'

Beltásar de Echave (1632-82) the younger, son of the elder artist of the same name, developed a style very different from that of his father. He was bold and vigorous but too impatient to finish his work well. His drawing is frequently faulty and his execution reminds one of Arteaga, of whom he was a contemporary. His compositions, however, show plenty of life and a strong sense of the dramatic. Although he was a follower of Arteaga, he foreshadows the new school which distinguished the following century. His 'Entombment' is one of the most notable works of the old Mexican school. Two other notable pictures of his, 'The Triumph of the Church' and 'The Triumph of Faith,' are both in the Puebla Cathedral, which also possesses several other pictures of his. 'The Savior,' 'The Martyrdom of Saint Peter of Veronica,' 'The Four

Evangelists,' in the Mexican National Academy are also good pictures.

The latter part of the 17th century, which Arteaga and Echave the younger influenced strongly, was very active in art. Juan Correa, whose drawing and coloring are excellent, painted much. His work shows freedom of execution, a firm handling of the subject and an easy swing of the brush, but his tone is often oppressive. Six great paintings of his are in the cathedral. With Correa begins a period of decadence in Mexican art. But he was a great teacher and he introduced new ideas into Mexican art which were destined to become the most noticeable motive power of the new school made famous by Ibarra and Cabrera, his two most noted pupils. He was lavish in his employment of figures, loved immense canvases and aimed at grand and imposing scenes. His grouping is artistic and the general tone of his picture is good. His characters show sincere feeling, and there is a general air of devotedness about his more deeply religious canvases. He has been rather under than over estimated by modern critics. His boldness of conception, freedom of execution and daring inspired to greater attainments his two great pupils. His 'Coronation of the Virgin,' the 'Triumph of Saint Michael' and the 'Entrance of Jesus into Jerusalem' all contain multitudes of figures, but the tone is gloomy and the coloring decidedly opaque.

Nicolás Becerra, who also belongs to the latter half of the 17th century, anticipates the characteristics of the painters of the first half of the 18th century, excellent coloring, boldness of conception and rapidity of execution. Another, Diego de Becerra, a Franciscan monk, of the same period, devoted his energies to depicting scenes and events in the history of the order. Many of his pictures were in the convents of the Franciscans in Mexico City and Puebla. Another priest, Nicolás Rodríguez Juárez, shows good coloring, simplicity of style and studied and well-executed drapery, all characteristically foreshadowing the coming school. He was the best portrait painter of his day. His 'Santa Gertrudis Offering her Heart to the Crucified Christ' (1690) is in the Mexican National Academy. Other pictures of his are in the Profesa and other churches of the capital.

Juan Rodríguez Juárez (1675–1728), nephew of José and brother of Nicolás, enjoyed a very high reputation in his day; and he had a strong influence over the younger artists, who were destined to later establish a new school. He was very prolific and many of his works survive. He painted a series of scenes of the Virgin of Tepozotlán, of which the most realistic and best executed represents the flight into Egypt, 'San Antonio,' 'San Francisco de Querétaro,' 'San Juan de Dios' are in Querétaro; an auto-portrait is in the National Academy. His are the decorative pictures for the altar of Los Reyes in the cathedral. Three paintings in the Profesa suggest Murillo. A colossal San Cristobal and the 'Vision of Santa Gertrudis' were in San Agustin Church. The 'Judgment of Saint Lawrence' (1702) is a notable picture. In the Carmelite churches are a number of his pictures and four large canvases are in the National Academy. He has a vision of the loveliness of color that reminds one of Murillo in no uncertain manner. He preached the doctrine of freedom from restraint and he revolted against the carefully-wrought work of the school of the elder Echave. His touch is light, his color brilliant, but his light and shade are weakly defined. He may be said to have been the father of a school that produced much brilliant work in Mexican art.

Among the other artists of this period are José Torres, Manuel Orellano, Diego Casanova, Juan de la Plaza (extravagant in coloring and execution) and Manuel Luna (coloring and drawing good). So brilliant is the coloring of the latter's work that much of it has been passed off as that of Murillo and his pictures have been gathered up and shipped to Europe where they have been sold as works of the great Spanish master.

Cristóbal Villalpando painted from about 1683 to 1710 in a very unequal manner; but few if any Mexican artists have had freer and bolder imagination than he or greater power of execution. In his imagination there was much of the poet, but he was affected with the Gongorism of his age and exaggeration and complexity mark his best work. His coloring is weak and his larger canvases are in poor taste yet some of his decorative work is excellent.

"Friar Manuel," a Jesuit priest, has been called the Murillo of Mexico on account of the brilliancy of his coloring; but his drawing is careless. His simplicity, boldness and softness of coloring leave no doubt that he had studied Murillo.

José Ibarra (1688?–1756), one of the two best painters of the 18th century, followed Juan Rodríguez Juárez to exaggeration. His figures, perspective and drawing are good and the general tone of his work is pleasing and effective but he shows strongly the mannerisms of his school. He is prodigal of reds and blues, often in masses, in the style of Murillo. He was a finished artist, a tireless worker and possessed of great natural talent. Many of his pictures exist in Mexico though many have been sold abroad. Nicholás Enríquez, an ardent admirer of Ibarra, was a follower of Rodríguez Juárez.

Miguel Cabrera, the close friend and colleague of Ibarra, has maintained, for considerably over a century, his position in the public estimation as the greatest Mexican artist of the 18th century. He was a most prolific worker. Even to-day, after dealers have been collecting his pictures for three-quarters of a century and sending them abroad, there are still scores of Cabreras in Mexico. He lived for his art and he painted pictures as Lope de Vega wrote plays, at a hot heat, with no time to pause. In 14 months (1756–57) he painted 35 pictures representing scenes from the life of San Ignacio for the Jesuit convent, and another series of like nature for Santo Domingo. His drawing is freer and better than that of most Mexican painters and he improved much on his inspirer, Rodríguez Juárez, softening the crude tones and shunning exaggeration. His grouping natural and excellent, his invention pleasing and full of intelligence, his coloring soft yet brilliant cast a certain amount of beauty about all his work. His taste is not so good as that of Echave the elder, his force less than that of Arteaga and his imagination less bold and free than Villalpando's; yet the general

average of his artistic qualities and the tenderness, devotion and mysticism displayed in his characterizations, easily place him in the front row of Mexican artists. His style is easy, light and comparatively free from mannerisms; and his brilliant coloring lacks the solidity of the previous school. Like Shakespeare he laid tribute upon all who preceded him, but upon all he made use of he placed the stamp of his own individuality, in grouping, painting and coloring and idealization. As he was the official painter of the Jesuits, their institutions were filled with his works. So great was his fame in his day that churches, convents, schools, the university and individuals overwhelmed him with orders and forced him to work to the limit of his capacity. With fame all kinds of honors came to him both at home and abroad. He was made official painter to the archbishop of Mexico and the archiepiscopal palace possessed many of his works. Rich churches paid him large sums to paint series of pictures for them. The mining town of Taxco engaged him to do all the decoration of the new church in that rich district and the church remains untouched to this day.

The 18th century witnessed the most active period in Mexican art, and more than 200 artists are said to have flourished during this comparatively short space of time. Francisco Antonio Vallejo, Francisco León, Juan Patrico Morlet, José Paez, Nicolás Enríquez and José Alcíbar, all followers of Cabrera, reflect the characteristics of his style. Alcíbar carried to exaggeration the softness of style of the school. He enjoyed a reputation second only to Cabrera, to whom he was really much inferior in talent, imagination and execution.

After Cabrera no passably good artist appeared for almost 50 years; for the enthusiasm that had built up the power of the Church in Spain declined rapidly even before the close of the 18th century; and with this decline, the erection and adorning of sacred edifices ceased, and good artists became scarce.

The Academy Artists.— For 50 years after the French Revolution the only artists in Mexico were Spanish professors sent over from Spain to the San Carlos Academy of Art and their pupils. Aguirre, one of these professors, painted the vaulting of the parochial baptistery of the Sagrario; and Rafael Ximeno did extensive decorating. His mural work is good but his oil paintings are poor. The 'Assumption of the Virgin' in the dome of the cathedral is by his hand. It is highly imaginative and full of action and possesses the true aerial quality necessary for ceiling decorations. Juan Saens and José M. Vásques, two of his pupils, helped him constantly in his work. Saens took part in the decoration of the cathedral dome and Vásquez painted the 'Annunciation' and 'Jesus with the Children' in Loreto church, and 'Saint Anthony Sustained by the Angels' in the chapel of the Sagrario. José M. Castro, another pupil, has left some fairly good pictures, one of which is in the National Academy. He exhibits considerable originality in his best work.

Francisco Eduardo Tresguerras, a Querétaro artist and architect of note, did considerable interior decoration in which he shows creative power that just falls short of being great.

The Puebla School, in the beginning followed Echave the elder, and in general it reflects the influences at work in Mexico City. Its artists are inferior to those of the capital. García Ferrer painted the six large figures that decorate the altar of Los Reyes in the Puebla Cathedral of which he was the architect. Diego Becerra executed a series of pictures for San Francisco Church, Puebla, 'Saint Francis in the Desert,' 'Saint Francis Accompanied by Angels,' and 'Saint Francis in a Chariot of Fire,' all of which are strong, realistic and well executed. José del Castillo and Miguel de Mendoza, an Indian prince, are two other well-known Puebla artists. Joaquín Magón painted the large mural pictures in the Puebla Cathedral sacristy, 'The Last Supper,' 'The Washing of the Feet,' 'The Protection of the Virgin,' and also a series of the 'Passion' in the Carmelite convent and another series on the same subject in the sacristy of Ocotlán, Tlaxcala. His coloring is too vivid and his work has an unfinished appearance. Miguel Jerónimo Zendéjas (1724–1816) was exceedingly popular. His technique is faulty but his work is pleasing. His best picture is 'Christ Praying in the Garden,' in the Puebla Sagrario. José Luis Rodríguez Alconedo, an artist of much talent, a sculptor and a botanist, expelled to Spain for revolutionary intrigue in 1808, acquired there great facility in pastel, which he introduced into Mexico. Two of his Virgins are in the Puebla Cathedral and two fine portraits are in the Puebla Academy, one of himself and the other of a Spanish lady.

Later Academy School.—Among the painters of the latter half of the last century whose works are represented in the National Academy are José Obregón, whose large painting 'Queen Xochitl,' the discoverer of pulque, the national drink of Mexico, is one of the most popular and best known in Mexico. Xochitl is represented as offering her discovery to King Tecpancaltzín, who is enthroned upon his seat of honor in the midst of his royal attendants. 'Hagar and Ishmael' is perhaps a better picture, though on account of the subject of which it treats it is not so well or popularly known. Rodrigez Gutiérrez' very striking 'Senate of Tlaxcala' represents that body deliberating on the course to be pursued toward the invader Cortés. The invention and grouping are better than the coloring. Pelegrin Clavé's 'Isabel the Catholic Attending her Sick Mother' is one of the best and most attractive pictures of his epoch. The coloring is rich and harmonious, the drawing good and the scene depicted is spirited. Juan Cordero has two pictures in the Academy, one representing 'Columbus and his Little Son at the Gate of Rábida Convent' and the other 'Columbus after the Discovery of America.' Juan Ortega's 'Meeting of Cortés and Montezuma' is full of imagination and fine coloring and is indicative of what the author might have continued to do. Salomé Pina enjoyed considerable reputation among his fellow-artists. Two of his pictures in the Academy, 'Abraham and Isaac' and 'Saint Charles Borromeo' are spirited in conception and execution. Luis Munroy's 'Roman Charity' represents a Roman girl conveying food to her imprisoned father. This and the 'Prodigal Son' and the 'Last Moments of Atala' are good pictures. Manuel Ocaranza has in the Academy two fairly good pictures in the characteristic style of the middle of last century: 'Love's

Wiles' and 'The Faded Flower.' Juan Urruchi reverts to the religious school of art of the 18th century in style and subject in 'Let the Little ones come unto Me,' 'Sor Juana Inez de la Cruz' and 'San Sebastian.' Gonzalo Carrazco is represented by two pictures, 'Job' and 'San Luis Gonzaga.' The latter scene is during the plague in Rome. Juan Manchola has created two fairly good pictures in 'A Miracle of Saint Peter' and the 'Good Samaritan.'

Modern Painters.— There is no school of modern painters in Mexico though there are good artists. This is because the artists have, for the most part, been educated abroad under different influences and environment, and have become neither Mexican nor foreign in sentiment.

José María Velazco, an excellent landscape artist, painted with great care and detail, producing canvases that won for him renown in Europe. His coloring is delicate and true to nature and his cloud effects are especially happy. Many of his best pictures have found their way to European galleries. France conferred upon him the cross of the Legion of Honor and Austria that of Francis Joseph; and other countries have rendered like tribute to his genius.

Félix Parra, best known of modern Mexican painters, does his work with loving care and in good taste. He shows invention, boldness of imagination and excellent grouping. His coloring, too, is good. Three of his pictures, 'Las Casas,' 'Galileo' and the 'Massacre of Cholula' have been photographed times without number and copies of them may be found in every curio store in Mexico. They are all striking pictures of sterling worth, in which the drawing is good, the conception vivid and the coloring in good taste. A smaller picture, the 'Flower Market,' is of greater artistic worth, but it is almost unknown, because it has always been in private possession. The comparatively small canvas is crowded with figures, all different and all true to life.

Herman Gedóvius, who received his art education in German and who reflects German influence, is probably the best portrait painter Mexico has produced. His early work was labored but his latter shows freedom of movement and mastery of color which reminds one of the old Flemish masters. His auto-portrait in the Academy is excellent.

Leandro Izaguirre, who spent 10 years in study in Europe, is the best known of modern Mexican portrait painters, but his imagination, execution and coloring are inferior to those of Gedóvius. Izaguirre once showed signs of possessing daring and inventiveness in his earlier works, especially in his great canvas the 'Torture of Guauhtémoc,' now in the Academy; but his European residence weaned him of things Mexican to the loss of native art.

Gerardo Murillo is perhaps the most characteristic of the younger Mexican artists, especially in Mexican landscape effects, which, on account of the high elevation of the valley of Mexico, are very difficult to analyze and depict. Very often his work is more sketchy than solid and he gains his effects in paint through the methods of the sketch artist. Yet he is generally strikingly effective.

Andrés Rios delights in painting scenes filled with figures. He inclines to historical characters and costume effects of which he has made a deep study. He has imagination, originality and daring in conception, execution and grouping. 'The Orator of the Day,' which represents parishioners complimenting the young parish priest on his sermon, displays Rios' skill in character painting and effective grouping and his love of detail in costumes and salon decorations. 'The Road to the Poor-house' is a powerful picture, well grouped and full of expression in which the same love of carefully-executed details are manifested. Juan M. Pacheco enjoys some reputation as a landscape painter; but his work is uneven, and often descends to the commonplace. Rafael Ponce de León, who died in 1908 while little more than a boy, won for himself a high place as a caricaturist in Paris, where the foremost art critics recognized his talent, his daring, his humanity. He is more than a caricaturist; the artist wells out in all his work. Alfredo Ramos Martínez, who received most of his art education in Europe, has had his pictures hung in the National Salon in Paris, where they attracted the attention of the critics and invited a wordy and prolongued discussion as to their merits, which are out of the ordinary. His most characteristic canvas in oil is 'Springtime,' a large picture representing a group of young women dressed in airy, light-colored costumes, and belonging to different national types, has for its scene a spring garden. The execution is daring, the handling of light effects startling and withal pleasing.

Alberto Feuster is also a young artist of much promise. His drawing is good, his conception bold and his coloring pleasing. He works carefully and loves to make use of all details consistent with his peculiar style of painting.

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14. ARCHITECTURE. Pre-Columbian Influence.— Mexico was by far the most important of the Spanish colonies of the mother country, which lavished upon her all the care a mother bestows upon a favorite daughter. The fabulous wealth poured into Spain from over seas she dispensed with a liberal hand in beautifying the home domain and in covering the new land she had discovered with magnificent edifices which, to-day, constitute the chief charm of the Spanish-American countries. The activity of the arts in Spain was coincident with the duration of that vast treasure that kept constantly filled to overflowing her coffers for almost three centuries. Mexico, more than any of the other American colonies, reflected the activity of the mother country. Especially was this so in architecture and its allied arts, painting, decorating and sculpture. A famous art critic has justly said that, during the Spanish régime, there were more monumental buildings erected in Mexico than in all the rest of America. This was due to several causes. The native civilization had already produced magnificent artisans while Europe was still in the dark ages. The existing ruins of the vast, highly ornate edifices erected befor Spain set foot in America compel the admiration of layman and architect alike. Of the skilled native workmen at the time of the Conquest, thousands had labored under the master builders of Montezuma and of the

sovereigns of Michoacán, of Yucatan of the Zapotecas and the Mixtecas. For untold years Mexican artisans had been accustomed to depend very greatly upon themselves in working out their plans and ornamental designs, all of which were controlled by partially conventionalized mythological ideas and Church polity. The European architects who arrived in Mexico from Spain almost immediately after the Conquest found these native artisans wonderfully skilful and resourceful; and they soon came to realize that the surest way to get the best results was to allow them to work out ideas not from a detailed plan but from rough sketches. The result was that, while Mexico adopted Spanish architecture, it did so with modifications introduced, consciously or unconsciously, by the native workmen who brought to their task traditions that, from time immemorial, had governed their plans and the manner of executing them.

Ibero-Indian Transition Period.— The Spanish conquistadores were in spirit much like the Crusaders. They fought the races of America in the name of the cross, and they smote the heathen for the greater glory of God. They demolished temples; they smashed idols throughout the length and breadth of the land with religious frenzy and they leveled gigantic pyramids that had required centuries for their erection. The priests and monks who followed the soldiers continued the demolition of all evidence of the historic past of the native races. But this work of destruction called for a counter work of construction. Missionaries spread all over the land; architects were brought from Spain to the larger cities and towns; while native Indian master-builders were employed in the villages and country places under the direction of the Spanish priests who had generally some knowledge of architecture. Soon the passion for building churches, convents, colleges, schools and priestly residences became as great as that for destruction during the first quarter of a century following the Conquest.

The architecture of this first colonial period was largely affected by native Indian ideas, as all the workmen were natives. As they did not know Spanish, and their masters and overseers were unacquainted with the native tongue, they were left very much to themselves to work out their own ideas of construction, more or less in conformity with the general plan of the architect or master-builder. In beauty of form and grandeur of conception the buildings of this epoch were very much inferior to the native edifices they replaced. But it was an age of reconstruction in which the builders looked more to utilitarian ends than to beauty. While the great, Moorish-like dome was the dominant feature in Spanish architecture, even at this early date, very few churches with handsome domes or vaulted roofs were built in Mexico or in any of the other American colonies in the first half of the 16th century, for these were architectural features unfamiliar to the native artisans. These early Spanish colonial edifices were a curious admixture of Gothic, Renaissance, Moorish and native American styles. In general the plan of the building was Spanish, modified by Moorish. The roof was the flat American structure in use in Mexico and Yucatan before the Conquest, while the ornamentation was a curious intermingling of Christian and Indian ideography and conventional European and American mythological conceptions. Compared with those that followed them, these early Spanish colonial edifices were plain and of unprepossessing appearance. But their study is both interesting and instructive, for they point to the buildings that were to come, with their mingling of the best in the art of Old Spain and of New Spain. Spanish domination brought to Mexico a tranquillity and an undisputed authority lasting three centuries, during which the Spanish court directed the energies of the colony and led the way in that great revival of art such as no other American colony experienced.

Various causes combined to shape the form and character of the public buildings of New Spain. The Aztecs, Mayas and other cultured races, owing to the weakness of their knowledge of scientific construction, had been forced to erect excessively heavy walls to support massive roofs and high ornamental façades, and the builders brought to their work, during the Spanish régime, an ingrained belief in the necessity for and the beauty of sheer massiveness in the construction of walls and façades, a belief which continued throughout the 300 years of Spanish domination. Mexico has always been subject to heavy earthquakes, and these have helped to accentuate this belief in the necessity of massiveness in the construction of the main walls of buildings. The monumental edifices of the country are often more massive in character than those of Spain. The walls of some of the Maya buildings still standing are from 6 to 10 feet thick and these are equalled in massiveness by the walls of the cathedral and other great edifices of the capital.

Building Material.— The more durable building material of Mexico was in no way inferior to that of Spain. A score of different kinds of excellent stone, all workable, much of it handsome and some of it, like the native tezontli (lava-rock), of a character to give a distinctive appearance to edifices constructed of it; marble of a dozen different varieties; and onyx as handsome and as varied as any in the world, were all at the command of the Mexican builder. There was in Mexico for dwellings, no light, durable earthquake-resisting building material such as existed in the forests of the United States and Canada in the early years of colonization and expansion. Adobe (sun-dried earthen bricks) took the place of lumber in the construction of the houses of the lower and middle classes of the upland plateaux; and it has kept its place to the present in the public favor. Owing to the fragile nature of this material, walls constructed of it are necessarily very thick. In country places even churches are frequently constructed of adobe, which, covered with stucco, presents a very pleasing appearance. There are towns of considerable size in the interior of the table lands where practically all the buildings are constructed of adobe, and the plain mud walls of the Indian pueblos are familiar and picturesque parts of the landscape. These are constructed probably as in pre-Columbian days, and villages

themselves, with their irregular, lane-like streets, are like their Aztec progenitors.

But as adobe is not suitable for the lowlands with their torrential rains, it is replaced there by uncut stone, for the town houses; and in the villages and country by primitive thatched huts with walls of bamboo or other poles, through which the air makes its way at will. Owing to the prevailing mildness of climate all the year and the excessive heat in the hot season, these Indian huts, on the whole, meet the requirements of their occupants, who lead lives very near to nature's heart.

The Dome and the Façade.— The architecture of Spain was influenced by the Romans, Goths and Arabs throughout the periods of Romanesque, Gothic and Renaissance supremacy. The Greeks, Phœnicians and Carthaginians, too, have left their impress upon it. It does not, therefore, belong wholly to any one of the recognized styles; but it is, for this reason, none the less interesting. Mexico followed Spanish models more or less closely; but as the Indian mind is prone to florid ornamentation, her architecture departed, in matter of detail, of execution and of adornment, from that of Spain. The Moorish dome, with its striking appearance, its handsome tiles and its frequently elaborate adornment, appealed to the Mexicans. It is, in a sense, related to their elaborately adorned aboriginal façades, towering often from one to two stories above the habitable part of the building. The dome is seen everywhere in Mexico. It peeps out from amid the clumps of trees sheltering the little Indian village; it crowns the summit of a commanding hill; it retreats, almost hidden from sight, to some little valley amid mountain fastnesses. Everywhere majestic, it lends a touch of Orientalism to a landscape for which it is eminently fitted.

Early Spanish colonial architecture in Mexico was largely influenced by the Gothic and the Moorish; but the buildings erected after the close of the 16th century followed some one of the various phases of the Spanish Renaissance. The Mexican and the Spanish mind alike understood the value of contrast and concentration in decoration. In the Maya buildings the elaborate ornamentation which they lavished upon their monumental edifices was confined, for the most part, to the upper stories, the lower having a plain surface of cut stone or stucco. This disposition threw into relief and thus made more effective the ornate superstructure. The Spaniard confined his ornamentation to parts of the façades, to the doors and windows and the parts of the towers above the level of the roof. This had a splendid cumulative effect, which can be seen in [the illustration] the façades of the Sagrario and the cathedral of Mexico City. This ornate style of decoration was especially fortunate in having for its execution such trained workmen as the Mexican Indians, artisans with ancient traditions to work by, the initiative to give individuality to their work and the skill to put it into execution. Side by side in Mexican architecture, often mingling and blending so as to be indistinguishable the one from the other, are evidences of the many-faced traditions of the native dynasties and the influences of Spain. The free hand of the native workman is best seen in the earlier buildings of colonial Spain, for later on he conforms in general to the standards set him by more exacting and better trained architects and master-builders. But this conformation is only outward. In the spirit of execution the attitude of the Indian mind is still strong. He has taken instinctively to the Spanish idea of cumulative effect, which, in another form, was his own; and his inclination in this direction often displays itself in florid ornamentation frequently approaching the uncouth; but it is always effective. In its adherence to Spanish forms, Mexican art is as notorious a disregarder of convention as the Spaniard himself in his adoption of the Renaissance, in building, painting, sculpture and all the arts. It is in this respect that Mexican architecture differs from that of Spain; and it is this very difference that makes it specially interesting; for we see within it the activity of the highly-developed native races of America, these ancient artist artisans, stone-cutters, wood-carvers, metal-workers, tile-makers and designers of all kinds, essentially thinkers, creators, builders, in love with their work of creation.

Styles of Mexican Colonial Architecture. — Of the early colonial edifices of Mexico, more middle-age than Renaissance, one of the best examples is the church of San Francisco at Cholula, about which there still clings that mysterious atmosphere that the Indian workman lent to all he touched in the years following the Conquest, while his ancient traditions were still vividly alive.

The Renaissance soon made itself felt in Mexico as it had already done in Spain. The Moorish dome was its inseparable attendant and New Spain, in a few years, became the centre of tireless building activity which was to cease only when the Spaniards withdrew from the country. This movement was at its height when the cathedrals of Mexico and Puebla were begun, in the latter half of the 16th century, when Mexico was under the Baroque influence; and before they were finished the Churrigueresque had supplanted it. The Puebla edifice was built more in accordance with the original Spanish Renaissance ideas of its architect; but the cathedral of Mexico, especially in its interior decoration, was strongly under the influence of these later two ornate styles, both of which are characterized by the interruption of straight lines, the breaking of entablatures and pediments and an inclination toward unexpected arches and curves. The Baroque retains the original column of the Renaissance, but it takes liberties with it by twisting it out of its primitive shape, running it into panels and stories and decorating it in an unorthodox way.

The Churrigueresque, child of the Baroque, ran to extravagance in its love of the ornate. It made of the column a thing of decoration; it broke it into all kinds of geometrical forms and transformed it into pillars and pilasters which became part of the mass-decoration. It laid its hand, too, upon the sculpture, making of it an integral part of the decoration scheme from whose involved mass it peeped forth just as did the curved and broken lines of the columns.

Both Baroque and Churrigueresque are char-

acteristic styles of architecture, developments of the Renaissance, influenced by Moorish and other ideas dominant in Spain at the time of its introduction. Both are splendid in their general effects, in their monumental façades and in their elaborate stone carving which, at a distance, gives to the façades the appearance of one huge piece carved from the living stone *en bloc*. This is the same impression that the great Maya buildings give. The Baroque in Spain was stamped with a strongly individualistic character; and the Churrigueresque, a very ornate development of it, became in Mexico the most truly expressive medium of the native mind. In the early part of the 18th century Mexico went mad over Churrigueresque, and all the invention, all the grotesqueness, all the fertility of imagination, all the originality of the native mind, were exercised in creating new forms of ornate and intricate adornments for church façades and interiors, which became masses of gold and silver, of richly-adorned columns and pilasters reaching to the lofty ceilings, of elaborate altars, splendid in their intricate carving, their paintings and their dominant tones of the precious metals. Intricate scroll work, fruits and shells proclaimed the influence of the native Mexican workman, while strange mythological designs showed that there still reached him echoes of the creed of his ancestors and of his pre-Columbian art. Yet the sense of proportion is ever there, and this strange mingling of various systems of art gives one the impression of a magnificent and unified ensemble. The touch of the artist is ever perceived in the best of these old colonial buildings; for Catholic mysticism, Moorish mysticism and native Indian mysticism seem to feel the bond that binds all mystics together.

Influence of Tolsa.— Manuel Tolsa, a noted Spanish artist and architect, who came to Mexico as a teacher in the National Academy of Art in the latter part of the 18th century, had been trained in a school that disliked intensely the Churrigueresque and he set about reconstructing the interiors of many of the public buildings of the capital, of Puebla and of other cities of Mexico. Under his direction the magnificent Churrigueresque altars and decorations were torn out of the Mexico City cathedral and replaced by very plain Greco-Roman, so that now only mutilated parts of the grand old decorations remain to give an idea of the magnificence of the interior when the most gorgeous of all the Spanish styles of architecture held supreme rule there. Fortunately, however, the north chapel of the building has been left practically untouched; the colossal façade of the Sagrario could not very well have been altered, and its interior has suffered much less than that of the cathedral. The example set by Tolsa spread rapidly and it became the fashion to decry this most characteristic of Mexican architecture; and untold harm was done to the unity of the old buildings, very few of which remain intact as their builders left them. The parish church of Taxco, the Sagrario and La Santisima in Mexico City, and San Martín Seminary, Tepozotlán, are examples of the magnificence of the old Churrigueresque churches in the days of their glory. But even of these only San Martín and Taxco have escaped the hand of the reformer.

Influence of Puebla.— During the Spanish colonial period there were, in New Spain, two centres of art influence, Puebla and the capital. The former was more directly affected by the spirit of Andalusia and the Moors. Cholula, a suburb of the present city, had been a great centre of art and of building activity prior to the Conquest, and its artisans were noted throughout the Aztec empire. So the Andalusians, who settled in the valley of Puebla, found cunning workmen there to help build up the semi-Spanish, semi-Moorish industries they began establishing in the country. Excellent beds of clay in the neighborhood helped the work along; and Cholula continued, after the Conquest, the industries the skilled Toltecs had established there before the Normans had thought of invading England. Tile-making, polished marbles and onyx, handsome pottery and clay figures instinct with life and depicting the national customs, became characteristic Puebla products. This industry had a strong influence upon the architecture of the city and the surrounding country. Buildings with great Moorish courtyards and exterior and interior decorations in ornate Moresque tile patterns began to make their appearance in Cholula almost immediately after the Conquest and, on the founding of Puebla, the centre of this influence shifted gradually to the new city. Puebla at once began to reflect the thought and manner of life of Seville with which it kept ever in close touch. Cholula became a place of Moorish domes elaborately decorated with tiles. To-day the little town is exhibited as a curiosity to the tourist as much on account of its all-prevailing church domes as its famous pyramid. Towers, interiors, altars and the hitherto undecorated bulk of great buildings were covered with tiles. Private residences and government edifices followed the fashion and Puebla came to reflect more and more the influence of Seville and of Moorish Spain. As Puebla was the one great town on the high-road between the capital and Vera Cruz, it became an important distributing point; and this helped to extend her Moorish influence. Even in the capital this influence is seen in existing buildings and many others of the same style have disappeared. The famous Jockey Club of Mexico City, completely covered with bluish tile, reflects strongly this Puebla style. Some of the Churrigueresque churches, whose ornate exteriors are set against a background of Puebla tile, present a gorgeous and fascinating appearance; but in many others the employment of the Mexican Moresque is not so fortunate, for it was not always applied in good taste. Consult Wilcox, M., 'Certain Phases of Spanish Colonial Architecture' (*Architectural Record*, June 1915).

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15. ETHNOLOGY. Ethnologically Mexico is one of the most interesting of the countries of the Western world. Within her boundaries are represented all the really great cultured races of North America. Her territory forms the bridge of the continents over which surged backward and forward for uncounted

centuries untold races, many of whom have disappeared forever, leaving behind them buried remains of their arts, their industries, their tribal customs and remnants of their various languages engrafted upon those of the races who succeeded them.

The historic races of Mexico belong to a score or more of families, which future intenser study and investigation may or may not show to be related. Many of the languages are divided into sub-families and these into dialects, some of which are quite separate, while others blend into one another so that it is hard to determine where one begins and the other ends. But all are indicative of the presence in Mexico of many races of distinct customs, habits and religious beliefs for a long period of time, and of the changes in the distribution of these people which had already taken place, and which were continuing to take place at the time of the Conquest. Mexico, as we see it in the first quarter of the 16th century, presents but one of the many ethnological phases of her kaleidoscopic existence.

Origin of Races.— Beside tradition, there is no guide pointing the way to the penetration of the cloud that hangs over the past of these mysterious races, other than such aids as are lent by linguistic studies, comparative ethnological investigations, archæological remains and such echoes of the past as have come down to us in the complicated mythologies of the various families inhabiting the western hemisphere.

Two great racial traditions in Mexico point to distinctly different origins for the two leading races of the country. Nahua tradition would seem to indicate that they came into Mexico from the north by way of the Pacific coast, while Maya tradition as invariably points to the east and more specifically to the coast of the Gulf of Mexico, as the direction from which they worked southward into their present habitat. And yet, when the great Nahua culture god, Quetzalcoatl, arrived in Mexico, it was by way of the Gulf of Mexico, and when he departed from the scene of his labors, for the unknown land from which he had come, it was by way of Coatzacoalcos (Puerto Mexico) on the Gulf side of the Isthmus of Tehuantepec. This and similar traditions have been used to prove that the Nahua tribes must have come from the east. Much is made of the fact that, while the Nahuas are represented, in their traditions, as coming from the north and west, Quetzalcoatl is as invariably represented as coming from the east, and that, as mythology is always older than tradition, the Nahuas must have come originally from the east and have afterward wandered north and come south again. There is nothing to support this hypothesis. It must be kept in mind that, in these traditions of race migration and in that of the movements of the culture god, there are wrapped up two distinctly different events, which, in all probability, have no relation to one another. Quetzalcoatl's office as messenger of the sun god who sent him on his mission of culture to Mexico necessarily forced him to begin his journey from the direction of the home of the sun which, according to Nahua tradition, was in the east; and the same reason made him sail away again toward the east when his mission on earth had been accomplished. The great prophet who came from the sun and the races that arrived from the west and north are, therefore, distinct in origin. The one is the creation of the imagination, the others bid us listen to the echoes of migration through several centuries of its semi-historic existence.

The origin of the Mexican people has been traced, by over-zealous investigators, to almost every race under the sun. Mongolians, Tartars, Japanese, Hindoos, Malays, Hebrews, Carthaginians, Irish, Welsh, Australasians, Eskimos, Assyrians, Persians, Egyptians and Africans have been successively put forward with elaborate arguments as the original forefathers of the Mexican people. But it is only within the past half century that serious investigation along scientific lines has been undertaken by properly trained workers. The result of this investigation shows conclusively that, whatever may have been the origin of the races of the American continent, that origin is to be sought for so far back in the past that races, customs, mythologies and tongues have had time to blend and to create a vast number of sub-tongues and dialects with their corresponding tribal and clan variations. It also shows that Mexico must have been originally populated before the domestication of wild animals, and even before many of the animals of the present day came into use in the Eastern Hemisphere. The horse, the cow, the sheep, the goat, the elephant, the camel, that had become an integral part of the civilization of the Old World, were unknown in America prior to the Columbian discovery. In general the animal life of the Western Hemisphere is so different from that of the eastern that a separation of many centuries is necessary to account for this diversity. The difference in the plant life of the Eastern and of the Western Worlds is even more noteworthy.

The uses to which the pyramidal structures were put in Mexico were very different from those to which they were put in Egypt and its neighboring civilized nations. If the buildings of Mexico and Central America have any affinity with those of the Old World it is decidedly not with those of the civilization of the Mediterranean. So, after reviewing the evidence which would derive the original races of Mexico from European or African civilizations we are forced to come back to the native traditions, which offer us the only glimmer of light in the darkness. As has already been stated, these traditions point to the north as the original home of the Nahua people; and investigators have taken this to mean somewhere in Arizona, New Mexico, Colorado or California. All these conjectures may be partially true, for it is probable the Nahuas were, at various stages of their exodus, in these several places. But it is still more probable that they came from much farther north and that, in their migrations southward, they followed the Pacific coast for a considerable portion of the way. There is a very suggestive similarity between the customs, culture and mythologies of the Nahuas and those of Kwakiutl people of British Columbia; and between those of the latter and those of the races of northeastern Asia whom they resemble in appearance. But striking though these similarities are, they go

show, by their several stages of development, that a very considerable space of time must have elapsed since these widely-separated races were in contact with one another.

The similarity of the myths and customs of other western and northern tribes would seem to connect them with the Nahua and with the people of northeastern Asia. As the Nahua and the Maya show affinities in culture, customs and traditions sufficient to suggest that they had a common origin, and as the more recent linguistic and ethnological investigations would seem to confirm this suggestion, the latter probably came from the same original habitat as the Nahua; but in their journey southward, instead of keeping to the coast, they made their migration eastward across the continent.

There are, in Mexico, races much older than the Nahua and the Maya, races that have, undoubtedly, been profoundly influenced by these latter arrivals, but have retained certain characteristics which still proclaim their earlier origin. Of these the Otomí, cojointly with the Chichimeca, are credited, in Nahua mythology, with being the first races created by Camaxtli, the Tlaxcalteca creator. Primitive though these peoples were, it is almost certain, however, that they were not the aboriginal races of Mexico; for in places we meet with strange tongues, curious wrecks upon the strand of time, that seem to have no affinity with those of the races dominant in the days of Moctezuma.

Distribution of Races.—A glance at an ethnological map of Mexico shows that the country is divided into a great number of race areas. One of these, comprising Lower California and a part of Sonora on the Pacific side, was populated, in historical times, by races of a low culture, who had undoubtedly been driven to these confines by the conquering Nahua and other races who swept over the great upland plateaux. Along the Rio Grande, in parts of Sonora, Chihuahua and Coahuila were nomadic Athapascans; while east and southeast of these was a still larger area covered by two great, distantly-related families, the Packawan and the Tamaulipeco, who occupied a part of Coahuila, all of Nuevo León and most of Tamaulipas. The country included between these areas already mentioned. Guanajuato, Michoacán and the Pacific Ocean, was held by the Nahua, a part of whom had migrated southward into Colima, Guerrero, Morelos, Mexico, Puebla, Vera Cruz and parts of the Isthmus of Tehuantepec, of which they held both the north and the south sides. In the heart of their territory, however, were the Tarascans, who occupied the state of Michoacán, and the Otomí who held Hidalgo, Querétaro, Guanajuato and parts of San Luis Potosí and Mexico; while on the Gulf coast, stretching north from the city of Vera Cruz to Tamaulipas, were the Totonaco and the Huasteca, races distantly related to the Maya of Yucatán, Campeche, Tabasco, Chiapas, Guatemala and British Honduras. Across the southern half of the Isthmus of Tehuantepec, stretching like a great blanket into Oaxaca, Vera Cruz, Chiapas and Tabasco, lay the Zoque; and between the latter and the Nahua of Morelos and Guerrero is the home of the great Zapoteca-Mixteca race.

All these separate ethnic divisions show decidedly distinctive racial characteristics. Their languages, industrial arts and mythologies present such variations and dissimilarities as could only come from distinct races or from families separated from one another in the early stages of their tribal life. Therefore Mexican ethnology has to deal with these races as such, and also with their relation to one another and the general influence they have had upon one another ethnically; for the mixing and the blending of the races which have successively appeared in Mexico, have been going on for ages, just as they are going on to-day, with added European and other elements.

But though the native ethnic elements are gradually losing their distinctiveness, or have already lost it, as in Tamaulipas, San Luis Potosí, Nuevo León, Coahuila and northern Chihuahua, yet there are many states, like Michoacán, Guerrero, Oaxaca, Chiapas and Yucatán, where the native languages are still spoken with comparative purity. In these parts of the country racial characteristics persist.

The Nahua is the most important of all the races of Mexico, on account of the vast extent of territory it covered, stretching as it did from the Rio Grande to Guatemala, the number of distinct dialects and tribes included within its racial boundaries, and the influence of its religious, social and industrial customs, its political policy, its vast trade and commerce and its colonizing propensities. The extent, shape and position of the territory occupied by the Nahua to-day, which is practically the same as at the time of the Conquest, would seem to prove the truth of the tradition that they entered Mexico from the north. They drove, like a gigantic wedge, through the barbarous tribes of the great plateaux lands of northern Mexico, forcing the Seri to the mountainous parts of the state of Sonora on the west and splitting apart the Apache and Toboso and crowding them back to the Rio Grande on the north, and driving the Tamaulipecos and the uncivilized tribes of southern Coahuila, Nuevo León and Tamaulipas also in the direction of the Rio Grande and toward the coast of the Gulf of Mexico. Encountering highly civilized peoples in the mountainous and easily-defended states of Guanajuato, Querétaro, Hidalgo and Michoacán, they skirted the latter on the west, making their way through Guerrero, and, pouring over the mountains to the east, overran Morelos, Mexico, Tlaxcala, Puebla, most of Vera Cruz and a part of Tabasco. A wing of the migration, coasting further south along the Pacific, left a strong colony on the southern shore of Guatemala, another in the interior and a third in Salvador, while a fourth settled upon islands in Lake Nicaragua and occupied all the land between that body of water and the southwestern coast. A fifth crossed the isthmus and took possession of territory on the northwestern shore of Panama, near the Costarican boundary line. The Nahuatl confederacy, headed by the Aztecs, extended its territorial dominion, though not successful in forcing its language on the conquered races or in assimilating them to the customs, the culture, or even to the political system of the Nahua; so that the people over whom it gradually extended its sway remain ethnically distinct to-day.

Linguistically the Nahua are divided into a score or more of distinct tribes, all speaking, with variations, the Nahuatl tongue. The Toltecs, who had disappeared as a political entity several centuries before the Conquest, were the most noted of the Nahua. They occupied a considerable part of the territory afterward held by the Aztecs at the time of the Conquest. The following tribes are now recognized as belonging to the Nahua race:

The Acaxee, speaking four closely-related dialects, inhabited the mountainous regions of Durango, between the Tepehuanes and the Aztecs. The Aztecs or Mexicans (including Tlaxcalans) were spread over a vast extent of territory from Tabasco, through southern Vera Cruz and across the state of Puebla, Morelos, Mexico and Guerrero, to the Pacific, and thence up along the coast, through Jalisco and Sinaloa, past the southern end of the Gulf of California. Another group of considerable extent occupies the shores of the Gulf of Tehuantepec. The Yaqui, also known as Hiaqui, Cahita, Cinaloa and Sinaloa, who were divided into three tribes speaking distinct dialects, Yaqui, Mayo and Tehueco, are closely allied to the Aztecs, with whom they have been classed. At one time they occupied considerably more territory than they do to-day. They extended over the middle and lower Yaqui, the Mayo and the Fuerte districts of Sonora. Now, so far as language is concerned at least, they are confined to the Yaqui River district. All the Yaqui tribes were energetic, patriotic and intelligent and they were one of the foremost factors in building up the civilization of Mexico. The Cazcanes occupied the mountainous districts of Jalisco about midway between Guadalajara and Zacatecas. The Conchos, now extinct, but at one time an important tribe, occupied a considerable extent of territory, lying between that of the Tarahumare on the west, the Apache on the east, the Tepehuan on the south and the Rio Grande on the north, their habitat being almost entirely within the boundaries of Chihuahua. The Cora, belonging to the northern or Sonora group of Nahua-speaking tribes, live along the Jesús Mariá River in the state of Jalisco. The Huicholes (Guachichiles, Cuachichiles), according to Orozco y Berra, occupied parts of Cochuila, Nuevo León, San Luis Potosí and Zacatecas. They were between the Laguneros on the north, the Otomí to the southeast and south and the Zapoteca to the west. Catholic missions were early established among them; they were brought under the domination of the Spaniards and their language finally disappeared as a tribal institution. In the heart of the Yaqui country were the Nio, who lived south of the Fuerte River. The Niquirán, one of the Nahua settlements furthest south, form a small community occupying the land between Lake Nicaragua and the Pacific Ocean and also the neighboring islands in the lake. About the headwaters of the Hermosillo and Yaqui rivers, between the Seri on the west, the Apache on the northeast, the Pima on the northwest and south, was the important Opata tribe, which consisted of two sub-tribes speaking distinct dialects, Eudeve (Heve, Dohema) and Joval (Ova). The most northern Nahua family, the Pima, was divided into the following scattered groups: Pima Alta (Upper Pima), situated principally in the United States, but occupying a small part of northern Sonora; Pima Baja (Lower Pima), who lived around the middle part of the Yaqui River, between the Tarahumare to the east, the Yaqui to the south, the Seri to the west and the Opata to the north; Potlapigua, near Babispe, northwest of the Opata country, Pima de Bamoa (Sinaloa), on and around Bamoa, on the lower Sinaloa River south of the Mayo; Tepehuán Pimas, a small group in the western part of the Tepehuan country. In southwestern Salvador are the settlements of Nahua known as Pipil and closely related to the Aztecs, while the Sigua (Serra Xicagua, Shelaba, Chicagua, Chichagua), a small Aztec colony on the northwestern side of Panama, marks the southermost limit of the Nahua extension. South of the Apache, east of the Concho and north of the Tepehuán, lived the Tarahumare, an extensive division of the Nahua family, covering parts of the states of Sonora, Chihuahua and Durango. They spoke a number of distinct dialects and their territory was divided into Tarahumare Alta and Tarahumare Baja. Tarahumare proper was spoken in the upper country while the tongue of the lower land was known as Chinipa. The Tepecano, closely related to the Tepehuán, occupy the territory between that of the Cazcan and the Guachichil in modern Tepic. The Tepehuan live principally in the state of Durango, south of the Tarahumare, where they are confined, for the most part, to the mountainous region for a distance of about 250 miles.

The Olive (Olivean), a race of lighter colored people than the tribes surrounding them, occupy territory southeast of the Pisone and Janambre, in the state of Tamaulipas. Tradition says they came from Florida, which may mean only the Gulf coast. They were superior in culture to their neighbors, but nevertheless their language has become extinct.

The Pakawán or Coahuilteco is the name given to a number of cognate tribes of southern Texas and northern Mexico. They covered considerable territory east of that occupied by the Toboso. This included, in Mexico, the eastern side of Coahuila, most of Nuevo León and the northern part of Tamaulipas. As these tribes were inclined to be nomadic and were but partially civilized, they rapidly lost their language after their conquest by the Spaniards.

Otomí (Hia-hiu).—The word Otomí is used in two senses. It signifies the race of people speaking the Otomí language; and it was extended to include, in a general way, those races which from time to time formed loose alliances with the Otomí for war or defense. They have been confounded with the so-called Chichimeca, and some authorities claim that they form one of the ethnic divisions of the latter vague indefinite tribal designation. The Otomí, who had distinct customs and a complicated mythology, but were less civilized than the Nahua, occupied a large, somewhat irregular, yet compact portion of central Mexico, where many of their descendants may be found to-day still speaking their ancient tongue. Their territory extended over part of San Luis Potosí, all of Querétaro and most of Guanajuato, reaching into the state of Mexico, a short distance west of Mexico City, and from there westward to Michoacán. On the east were the Huasteca, a

the southeast the Tarascans and along the northwest the Nahua. They were divided into four tribes: Otomí proper, Pirinda, Pame (northwest of the Otomí) and the Mazahua (east of the Tarascan, in the southwestern part of the state of Mexico). In the time of the later Aztec empire the Mazahua occupied the province of Mazahuacán situated in the western mountains of the valley of Mexico. They were subject to Tacuba. The Pirinda territory was principally in the valley of Toluca, and some descendants still live in villages in the land of the Mexicans, others in Tarascan territory. The Otomí were a numerous, industrious and fairly intelligent race.

Under the heading of "Rio Grande tribes," Orozco y Berra groups a number of native communities occupying territory in the state of Tamaulipas at or near the mouth of the Rio Grande River; but he furnishes no further data respecting them with which to classify them; but as the Indians of this district no longer retain their tribal organizations, and as their languages have also disappeared, little is known of their pre-Columbian culture.

The Seri, who occupied a considerable extent of territory on the mainland opposite the peninsula of Lower California, where their language is still spoken to some extent, are classed among the less civilized of the Mexican races. Their territory stretches inland into the mountain region for 150 miles or more from the coast, and includes the island of Tiburón (shark) in the gulf.

Under the head of Tamaulipeco, Orozco y Berra, who has paid more attention than any other investigator to the races of Tamaulipas, where the native languages have all practically disappeared, gives the following tribes: Tamaulipeco proper, Canaynes, Quinicuanes, Borrados, Tedexenos, Pasitas, Tagualilos, Caribayes, Mariguanes, Panguayes, Anacana, Cadinia, Guixolotes, Pintos, Comecrudos, Malinchenos, Ancasiguais and Aretines.

The Tarasco (Michoacano), occupying approximately the state of Michoacán, speaking a distinct language and having customs, myths and traditions different from those of the other races of Mexico, form one of the important racial divisions of the republic. They are a highly cultured people and, in the time of the Aztec empire, they maintained a separate, independent government.

From the city of Vera Cruz northward to the Huasteca and inland to Tlaxcala, lie the Totonaca, almost completely surrounded by the Nahua. They were a cultured race at the time of the Conquest, and it was among them that the conqueror, Cortés, established the first Spanish government and colony on the mainland of the American continent.

Two cognate tribes, the Waïcuri and the Pericu, occupy the southern end of the Isthmus of Lower California. Their languages, which are still spoken, are very badly corrupted.

The Yuma family is represented in Mexico by the Cocopa (Cucapa) and the Cochimi, who occupied all but the southern one-fourth of Lower California. The native tongue is already badly corrupted and is fast disappearing.

The Zoque, stretching over four and one-half degrees of longitude, across the Isthmus of Tehuantepec, from east to west, and occupying parts of the states of Oaxaca, Chiapas and Tabasco, are surrounded by Zapoteca, Chinanteca, Maya and other races. The Zoque family is divided into four branches, Mixe to the north and west of the main territory, Zoque proper, to the south and east, Tapachula, in the southeastern corner of the state of Chiapas, on the Guatemala boundary line, and the Popoloco in the state of Puebla.

The great Athapascan family is represented in Mexico by the Toboso and the Apache. The area and location of land occupied by these two nomad, warlike tribes changed from time to time; but, roughly speaking, the Apache occupied an irregular territory, stretching southward from the Rio Grande and the American boundary line for a distance of five degrees of latitude, from about 105° westward, covering parts of Chihuahua and Sonora. But they often raided over the northern part of the latter state far into the interior. The Toboso also occupied territory stretching from the Rio Grande southward, but their general habitat reached eastward from the western boundary line of Coahuila, within which state they lived in normal times. They often joined hands with the Apache in raids on the more civilized parts of the surrounding country; and they frequently gave the United States and the Mexican governments considerable trouble. Sometimes the depredators took refuge on the American side after a raid on Mexican citizens and vice-versa when they had raided American territory.

In and around the town of Chinantla, south of Vera Cruz, occupying territory about 100 miles in extent, are the Chinanteco, who are probably a survival of one of the ancient races who populated the country before the arrival of the Nahua. The Huave (Huabi, Guavi, Juave, Wabi), another primitive race, occupy the marshes around the great lagoon which forms the northern inlet of the Gulf of Tehuantepec. Tradition says they once possessed all the isthmus country and that they came from the south. The Janambre, a third primitive tribe of a very warlike disposition, who occupied the rugged southwest of Tamaulipas, from a short distance north of Victoria to the southern boundary of the state, about 100 miles, gave the Spaniards much trouble before they were finally conquered toward the close of the 18th century.

To the south and east of the southern Nahua and stretching from Guerrero to the Isthmus of Tehuantepec was the home of the great Mixteca-Zapoteca family, which in culture, intelligence, enterprise and achievement was scarcely inferior to the Nahua and the Maya, between whom they seem to have been the medium of communication and of the distribution of the arts and sciences. They possessed a culture which, while it resembled that of the Maya and Nahua, was nevertheless distinct. The Mixteca whose territory extended into parts of Puebla, Guerrero and a considerable portion of Oaxaca, were surrounded on the north and west by the Nahua, while the Zapoteca were their neighbors on the east. They had an outlet on the Pacific Ocean to the southwest, which they may have possessed for a long time, since it is the boast of one of their oldest legends, that their great culture hero, Yucano, defied the Sun, engaged him in combat and drove him into the ocean. The Mixteca lan-

guage is still spoken over most of the Mixteca country. The traditions of the Mixteca make them an alien race fighting desperately for years for their existence, in the mountains, a part of which they were forced to abandon. The rugged nature of the country in which they lived created, in time, numerous dialects of the Mixteca. To the east and partly to the south of the Mixteca country lay that of the Zapoteca, stretching for a considerable distance along the Pacific Coast and occupying the southern side of the Isthmus of Tehuantepec, reaching north and west of the city of Oaxaca and including the famous valley of Oaxaca, in the mountainous districts of which the native tongue is still spoken with comparative purity. The pottery and the metal work of the Mixteca and the Zapoteca were sought by the Mexican merchants, who distributed them over a wide area of country.

The Maya family, the most highly civilized of all the native races of America, is divided into two great groups, the Maya and the Kiche, to which may be added the Huasteca. The Maya proper, within whose territory were contained most of the semi-historical cities of the more advanced culture of Mexico, were spread over all the peninsula of Yucatán, eastern Tabasco, British Honduras and the island of Carmen. They were divided into Lacandón, Mopán and Itzae or Petén, three tribes speaking slightly different dialects. The Lacandón still inhabit a region near the headwaters of the Usumacinta River, in eastern Chiapas and northern Guatemala. They were once a very extensive and important people; but their ancient greatness has disappeared. They still speak their native tongue. The territory of the Itzae occupied a part of northern Guatemala and eastern Yucatán stretching westward probably to Campeche and southward to Chiapas. The Mopán occupied an undefined territory partially in southern British Honduras, Guatemala and Chiapas. To the south of them were the Chol, also a Maya tribe, to the west the Lacandón and to the east and north the Itzae.

The Huasteca, a tribe situated far from the parent stock, and extending from Tampico southward and westward is wedged in between the Otomí on the west, the Nahua, Totonac and Tamaulipas tribes on the north. It was once a powerful nation and the people of to-day still bear all the racial characteristics of the Mayas.

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16. LITERATURE. All the cultured and most of the semi-cultured races of America, including the warlike red-man of the north, had a passion for oratory and story-telling, forebearers of formal literature. The Aztecs, the Mayas and other more civilized nations of Mexico had, years before the Conquest, evolved literatures which had already begun to break down the barriers of conventionality. The these literatures were noble in sentiment, passionate in utterance and beautiful in form the fragments that have come down to us, principally in the shape of translations or transcriptions into some one of the native languages leave no doubt. Mistrust has been cast upon the legitimacy of these fragments by recent critics; but the fact that, after 400 years, they represent, in their utterance, form and spirit the soul of the Indian mind to-day, so distinctly different from the Latin and the Saxon, places upon them the stamp of genuineness. Altamirano, the greatest, the most passionate, the most subtly poetical, the most oratorical of Mexican literary men, was a full-blooded Indian. In him we see reproduced, in the 19th century, the prototype of his Indian forebearers, who were the literary glory of the courts of Netzahualcoyotl and Montezuma II, where oratory and other literary efforts were sedulously cultivated and the successful public speaker was honored almost as a prophet and as the bearer of a message akin to that of the divine oracles.

To the intolerance and unfortunate policy of Spain, who waged a relentless war of destruction upon these written records which kept alive the memory of the past greatness of the native races of Mexico, we owe the annihilation of this literature and the enslavement and debasement of the cultured nations who created it.

According to native Indian writers, the reign of Netzahualcoyotl, king of Texcoco, was the Golden Age of Mexican literature in the pre-Conquest days. The monarch himself, who was the leading spirit in the literary movement of his reign, gave much of his time to literature and the sciences known to his people. Round his romantic career cluster many a legend and story. Early Spanish writers

Mexican subjects and native Indian literary men represent him as a great and inspired poet, which he may well have been, for poetry is the gift of the Mexican people; and the stories and legends still current among the ignorant Indians are often strikingly imaginative, poetical and beautiful. To the literary men of Indian race who learned Spanish shortly after the Conquest and wrote in it, we owe much of the information we possess of the culture and history of the native races of pre-Columbian days. The best of these Indian writers was a direct descendant of the famous Netzahualcoyotl. These Indian literary men of the early days of New Spain formed a promising literary school; but the policy of Spain, which had already led her to destroy the pre-Conquest literature and records of the native races, soon began to show itself in the oppression of the Indians, their nobles and their princes; and the most active and aggressive members of the native literary school, on account of the prestige they had won and the influence they retained, were among those most fiercely persecuted. Broken in spirit, they soon ceased to be active figures in the national life.

Of the post-Conquest literature of the 16th century but a very small part has come down to us; and this is principally in the form of letters, grammars of the native languages, chronicles of the religious orders and information of a like nature. The letters of Cortés, the 'History of the Conquest of New Spain' by Bernal Díaz del Castillo, the works of Las Casas and de Sahagun are invaluable on account of the information they furnish and the light they shed on the customs, habits, government, industries, religion and superstitions of the native races prior to the Conquest. Fernando de Alva Ixtlixochitl, a lineal descendant of the royal house of Texcoco, in his 'History of the Chichimeca,' gives a most intimate picture of the life of the court of Netzahualcoyotl and extensive and interesting information concerning the Nahuatl race at the height of its glory. Acosta's 'History of the Indies' furnishes valuable data about the Spanish colonies at a time when the writer was still in touch with men who had known intimately Cortés, the conquistadores and many of the Indian princes. Toribio de Benevente Motolinia, Geronimo de Mendieta, Agustin Dávila Padilla, Francisco de Aguilar, Juan B. Pomar, Gil González de Ávila, Alonzo de Zurita, Francisco Cervantes de Salazar, Francisco López de Gomara, Fernando Alvarado Tezozomoc, Beltazar Dorantes de Carranza, Juan de Cárdenas, Pietro Martire d'Anghiera, Pedro de Alvarado, Diego de Godoy, Juán de Zumárraga, Antonio de Mendoza, Fernando Alarcón and Antonio Villa-Señor have left us full or partial pictures of life before, during or immediately after the Conquest, or throughout the 16th century, which make our knowledge of early Mexican history more complete than that of any other part of the American continents during this period.

The enthusiasm for literature and, more especially, for poetry in the latter half of the 16th century was one of the distinguishing features of the life of New Spain. For the most part the writers were native-born Mexicans, some of Spanish, others of Mestizo or Indian blood. Balbuena, the garrulous old priestly chronicler, tells us that, during the last quarter of the 16th century, there were numerous literary contests held under different auspices and that, at some of these, so numerous were the candidates, 300 contestants entered for poetic honors alone. He also asserts that as poets they might have compared with the most flowery in the world. It is more than probable that the foremost Mexican critic of his day was mistaken in his estimate of the literary excellence of these contestants, the very names of most of whom have disappeared.

Good poetical form, correct language and the sparing use of poetic adornment characterize this period which is, however, inclined to prosiness and the imitation of Spanish literature. Yet it shows originality enough to redeem it from being the work of pure imitators. Tones of expression, development of subject and the handling of the matters treated of distinguish the Mexican literature of this period, in an interesting manner, from that of Spain. This is all that could be reasonably expected of it in an age when the whole American world, south of Virginia, rotated about the Spanish court.

Among the Mexican literary men of the latter part of the 16th century who have been praised by Lope de Vega and other noted Spanish writers of that age, is Antonio de Saavedra Guzmán, author of 'El Peregrino Indiano' (1599), a 20-canto poem, in which a bold attempt is made to sing the deeds of Cortés and his conquistadores. This poem is true to historical fact, displays careful investigation and reveals a wide knowledge of the subject and close intimacy with Aztec customs; but it is monotonous and prosy. Guzmán was a mestizo whose father was one of the conquistadores and his mother an Indian princess of the royal house of Mexico. He spent seven years in collecting the material for the 'Peregrino' whose dominant characteristics are simplicity and naturalness.

Of the writers of this period, a portion of whose works have come down to us, Fernán González de Eslava is one of the most interesting. He was wonderfully popular in his day as a writer of *autos sacramentales*, a kind of religious drama in high favor for over a century in New Spain. He was so notable a poet as to attract attention in Spain itself. His dramas were long performed and read and they have been presented to appreciative audiences in Mexico within the past 50 years. Francisco Terrazas, who belongs to the same period as Eslava, had the honor of being warmly praised by the great Cervantes. Juán Arista, Pedro Flores, Bernardo Llanos, Francisco Plácido, Eugenio Salazar, Carlos Sámano and Juan Pérez Ramírez, were all poets highly esteemed by their contemporaries. To these we must add the name of Bernardo Balbueno, to whom we are indebted for our information concerning the literary activity of the latter part of the 16th century. Balbueno was a great lover of Mexico whose praises he constantly sings. He branched out into all kinds of literary endeavor and proved himself an excellent and interesting critic. He wrote with great facility and elegance in both Spanish and Latin and is said to have been a master of Aztec. 'Mexican Greatness,' 'The Golden Age in Erifile' and the 'Bernardo' are his best-known works. Juan Pérez Ramírez was a poet of

international reputation and wonderful popularity in his own day, and he and Alarcón, another Mexican writer, have been much written about and praised in Spain. Plácido was a full-blooded Indian of noble Mexican family who first sang the praises of the Virgin of Guadalupe, the patroness of Mexico, who, her critics say, is the ancient mother of the Aztec gods transformed into a Christian saint. However that may be, the Indians of Mexico have shown a wonderful devotion to her; and it was fitting that Plácido, a lineal descendant of the Aztec priests, should have been the first to sing her praises. As the cult of this saint grew in popularity and spread to the ends of the republic, numerous Mexican poets, from time to time, recounted her glories, in from fairly good to indifferent verse.

This cult of the Virgin of Guadalupe by Mexican literary men during the latter part of the 16th and all of the 17th centuries presents two interesting phases. In Guadalupe there was, in pre-Columbian days, one of the most popular of native shrines. This shrine, a few years after the Conquest, was suddenly changed into a Christian sanctuary, on account of the reputed miraculous appearance, near the sacred well of the Aztecs, of the Virgin herself, to Juan Diego, an Indian, whom she commissioned to bear a message to the archbishop of Mexico, stating that she desired erected, on the hill top, above the well, a chapel dedicated to her worship. This chapel was duly built; and, since that day, the thousands of Indians who flock to it annually have made of it a most interesting depository of the mingled faiths of the aboriginal races and their Spanish conquerors. The literature that grew up around this historic shrine was, therefore, further removed in form, spirit and execution from that of Spain than any other class of writing emanating from Mexican sources. Yet whatever may have been the spirit and the influence of this distinctly national literature, its expression and the peculiar form it assumed were directly dependent upon the popular *autos sacramentales* and the encouragement given to them by both church and state and by people otherwise exercising authority throughout the land, all of whom were encouraged to extend their patronage and support, by the court of Spain itself and by the home church.

The *autos* were performed in the presence of vast multitudes, in the day time. They began as a species of miracle play intended to teach the natives what it was considered necessary they should know of the dogmas and history of the Catholic Church. Naturally the priests were the first writers of *autos;* and they continued to be their most prolific producers. But the call for new *autos* daily and their immense popularity with all classes, from courtier to peasant, made the demand much greater than the Church could satisfy; so lay writers soon found a paying field for their literary activities in the production of these primitive religious dramas. Thus the Church became the patron of literature as she became that of art in Mexico. The simple primitive *autos,* intended for the edification of the Indians, with a small admixture of mestizos, were often written in Aztec, and were almost always performed by Indians. Occasionally one may still come across one of these curious old dramas presented by Indians in some little interior Mexican town during Holy Week, and at the beginning of the present century they were still features of the celebration of this festival in many parts of the republic. But the Church authorities set their stamp of disapproval upon them and they rapidly disappeared.

The autos intended for the edification of the vice-regal court and the Spaniards resident in the capital of New Spain, who disdained the amusements of the masses, were of a distinctly higher literary value. For the encouragement of these latter dramas the ecclesiastical cabildo and the city council of the capital offered prizes for the best literary compositions, and more especially for those of a religio-dramatic nature. The coming of a new viceroy, the dedication of a church, the consecration of a bishop, the crowning of a Spanish monarch were taken advantage of for the holding of a literary contest at which, as we have seen, hundreds of candidates for literary honors presented themselves. The plays of the successful competitors were honored by being first presented before the archbishop of Mexico or the viceroy, or both, in the presence of a chosen audience consisting of the notables of church and state of the capital. From the blending of the simple native Indian plays and the efforts of the literary purveyors of the court of the viceroy came the noteworthy dramatic activity which has distinguished Mexican literature almost continuously from the Conquest to the present day.

Another class of early post-Conquest Mexican literature was the *canciones divinas* or sacred songs, which were distinguished for their chaste language, simplicity, naturalness, grace and excellency of metrical form. The best of the Mexican writers in this literary field fell very little below the mystic Spanish poets of their day, if we except the two great leaders of the movement on the peninsula.

17th Century.—With the encouragement given by the ecclesiastical and state authorities in both Mexico and Spain, the 17th century began with a very notable literary activity which continued on into the following century. The names and all or part of the works of scores of writers of this period have come down to us and enable us to judge pretty accurately the literary activity of more than a century of intense devotion to literature in the Aztec capital. Latin verse was sedulously cultivated and its influence upon the literature written in Spanish was very considerable; it helped largely to stamp the characteristics of the period which were marked by increased literary activity in a much broader field than that occupied by the writers of the preceding century, and by a tendency away from the naturalness which distinguishes the early Mexican literary school. This indicates a certain degeneracy which becomes more marked toward the end of the century. But it is a degeneracy which the Mexican writers share with those of the mother country. Yet the period is characterized by strong intellectual activity expressed in an exaggerated style known as Gongorism or culturism, whose distinguishing features are pomposity, grandeur of language and stateliness of versification marching along a broad highway leading directly to extravagance, exaggeration and obscurity of diction. Of the

more than 100 writers who, in a century and a half of activity, attained to more or less literary prominence, there are very few who rise above mediocre. They all worship at the shrine of Gongorism and lay upon its altar involved, obscure constructions and ornate descriptions overloaded with classical references. The literary spirit was all-pervading, far-reaching, yet the age has produced comparatively little that is worthy of preservation for its literary merits alone. "Poets were as plentiful as dirt," one of the critics of that day tells us; they turned their hand to everything; and they treated every subject in very much the same way, religious poetry, lyrical, heroic, amatory, dramatic, epic. Even the prose works, which are the best of the period, are marred by Gongorism.

Among the poets of this period who, following in the footsteps of Plácido, made a literary cult of the Virgin of Guadalupe, were Carlos de Següenza y Góngora, who published three volumes of poems devoted to singing the glories of the Indian saint in excellent verse and lyrical metre; Francisco Bramón, 'Songs of the Virgin' (1620); Luís Sandoval y Zapata, many high-sounding devotional poems in a decidedly Gongoristic vein; José López Avilez, stately Latin poems recounting the glories of Our Lady of Guadalupe; and Antonio Morales Pastrina, fervid religious poems in praise of the patroness of the Mexican people. All these poems, a small part of a somewhat extensive literature, are touched with the strange, passionate longing of the Indian for his vanished past; and one feels in them, at times, the presence of that ancient mother of the gods whose spirit, for the Mexican Indian at least, still hovers about the rocky heights of Guadalupe.

Most of the Mexican poetry of the 17th and 18th centuries is touched with the religious spirit of the age and many poets were professedly devoutly religious. To this class belong Pedro Muñoz de Castro, Juan de Guevara, who wrote religious poems and *autos* which were wonderfully popular; Francisco Ayerra, Juana Inez de la Cruz and Francisco Cochero Carreño. During the 17th century, however, the drama, which, as we have seen, was purely religious, turned to profane subjects, without deserting the autos and miracle plays. Agustín Salazar, who died at the age of 33, had already won for himself the foremost place in Mexico as a dramatist and writer of comedies and *autos*. Eusebio Vela, a very prolific writer, was considered the equal of most of the Spanish writers of his day in conception, execution and management of his plots and characters. Alonzo Ramírez Vargas also wrote a number of excellent dramas, the best of which is 'The Triumph of Diana.'

A favorite occupation of the poets of the 17th century was the writing of history in verse. Of these historical poets Gaspar Villagrá and Pedro Árias Villalobos are the most worthy of note. The former wrote 'The History of New Mexico' and the latter 'History of Mexico,' both of which are prosy and tiresome.

Of the prose writers of this period one of the most noted is Pedro Avendaño, who was one of the first of a long line of illustrious priests to take up the cause of the criollos (people of white blood born in Mexico). In 1692 he preached several sermons in Mexico City in which he warmly expressed the feelings of the oppressed criollos and criticized the pro-Spanish attitude and addresses from the pulpit of the archdeacon of the capital. For this and other similar acts he was expelled from the Jesuit order; but this only increased his popularity with the masses to whom he continued to preach and over whom he exercised a strong influence. He possessed a withering sarcasm, powerful invective and great facility of expression. His keen reasoning powers and his command of imagery make his writings and sermons always vivid and effective.

The 18th Century continued to manifest the same strong interest in literature that distinguished the two preceding centuries, but certain changes had taken place that showed the old influences were passing away. José Abad (1727–79) was the last of the great Latin scholars of Mexico who made a pastime of writing in the cultured tongue of the Cæsars. Francisco Ruís de León goes back to the age of the Conquest for his inspiration in his 'La Hernandia,' a long poem containing many excellent passages and pictures of the various characters who play their several parts therein. Although falling below the level of a great epic, the 'Hernandia' is superior to all previous attempts made to evolve a great poem out of the events of the conquest.

Of the many religious writers of the period José Manuel Sartorio and Francisco Soria are the best. Sartorio, a priest, strongly in favor of the independence of Mexico, was one of the most noted orators of his time; and, like Avendaño, he wielded a powerful influence over all classes. He was a tireless and prolific writer and has left 23 volumes of miscellaneous and devotional works and sermons and seven volumes of sacred and profane poetry. His religious poems, which constitute his best work, are often animated, natural, easy in style and filled with fine imagery.

The most popular dramatist of the 18th century was Arriola, whose best play is 'There's nothing Worse than Jealousy'; but Cayetano Cabrera Quintero was more prolific and possessed of more talent than Arriola. Among his comedies are 'A Disappointed Hope' and 'Iris of Salamanca.' 'A Study of the Coat of Arms of Mexico' is his most noted work. Manuel Soria disputed with Arriola the claim to be the most popular dramatist of the century. One of the best writers of the Calderón school he has left, among others, the following dramas: 'William Duke of Aquitaine,' 'Mexican Magic,' 'The Genoese' and 'Love and Jealousy.' Though strongly Gongoristic, his dramatic situations are excellent, his verse free and natural, the development of his plots always interesting and he is never at a loss to express passion and sentiment in a pleasing and effective manner. Manuel Zumaya was the author of 'Partenópe,' a very successful opera, and 'El Rodrigo,' a popular drama first produced in 1708. He translated into Spanish a number of the most popular Italian operas of his time for the Spanish stage. Another translator of note was José Rafael Larrañaga, who was the first to turn the works of Virgil into excellent Spanish. This translation

is faithful to the text and the spirit of the original.

The greatest poetical genius of the 17th century in Mexico was Sister Juana Inez de la Cruz (1651–94), whose name is a household word in her native land, where every Mexican holds her up as the perfection of literary art. She plays upon all the passions of the human heart and she wanders into many bypaths of literature. Lyrical, amatory and descriptive poetry and the drama she manages with equal skill and facility. In her own day she was looked upon as a paragon of learning and was credited with such superior poetic genius that she was and is still called the 10th muse. Yet she had the defects of her age; and modern literary standards, while admitting her superior talent, find her guilty of Gongorism.

The next most important figure in the literary life of Mexico, after Sister Juana Inez de la Cruz, is Manuel Navarrete (1768–1809), who may be said to have restored lyric and descriptive poetry to his native land. Naturalness and a keen appreciation of the beauties of nature distinguish his work, which is dominated by deep philosophic thought and pitched in an elevated style uncommon in his day. His verse is strong and sonorous and his subjects are presented in a masterly manner. The religious feeling of primitive peoples is strong in him. His god is the god of the storms and winds, the all-powerful, the maker and unmaker of men and nations, who wipes from the earth, when He wills, the mightiest of the works of men. He is the Divine Providence of the world, and all that He does is good because He does it. Through and behind Navarrete's undoubted Christian faith there appears the ever-present glory of his strong conception of ancient paganism. His god is the divinity of the ancient Greeks, Romans and Hebrews who rides upon the clouds and plants His footsteps on the storm. His faith is the simple faith of a primitive age; and his poetry, true to this attitude, creeps ever close to the heart of nature. His language is always simple, clear and correct, his lines harmonious, his taste good and his moderation in the use of poetical and oratorical adornment noticeable in his age. He rose above the prosiness and mediocrity of his time. Zorilla, the Spanish poet, has said of him: «The defects of his works are those of his age; their beauty and excellence are his own.» Navarrete was a close student and a great lover of Greek and Roman mythology; yet such was his natural genius that he was able to hold a steady midway course between the excesses of Gongorism and the barrenness of prosism in an age when both were rampant in Spain and Mexico. His odes and religious poems are his best work. Of the latter his 'Divine Providence' is one of his most characteristic compositions.

Mexican literature has always been noted for the number and excellence of its historians, and three, Gama, Veytia and Clavijero, add lustre to the 18th century. To their industry, clearsightedness, power of discrimination and perspicuity of style we owe much of our knowledge of the history of New Spain.

Nineteenth Century.— José Joaquín Fernández de Lizardi (1771–1817) forms the bridge between the last of the schools that grew up, flourished and declined under the patronage of the Spanish Crown and the new school which came into being with the success of the revolution which made of Mexico an independent nation. He is the most pronounced herald of independence and the keenest thinker of his day. For this reason he is universally known wherever the Spanish language is spoken as «El Pensador Mexicano» (The Mexican Thinker). 'El Periquillo Sarmiento,' his most famous work, is as well known in Spain as in Mexico. It has been published many times and is now looked upon as a classic in the Spanish tongue. In vain the critics have pointed out its many faults in style, its Mexicanisms and its careless use of words. It is so true to nature, so full of compassion and understanding, yet withal so humorous, so sprightly, so convincing, that it appeals directly to the universal human heart. The 'Periquillo' analyzes character and actions and presents the reader with innumerable charming pictures which he instinctively feels are true. Lizardi was a publicist in the broad sense of the word, and he has left innumerable articles of all kinds and treating of a great variety of subjects. Next to 'Periquillo' his most popular works are his 'Fables' and his 'Sad Nights.'

Among the successors of Lizardi are Manuel Carpio (1791–1860) and Manuel Eduardo de Gorostiza (1789–1851), two names which have shed lustre on Mexican literature. Carpio displays a wide range of sympathies; and his descriptive poetry is considered the equal of any written in Mexico. He is the first and best epic poet of his country and his lyrics have the true lyrical swing. Gorostiza led the way to the production of modern drama in Mexico. He was the first to enter the field which was so successfully filled, later on, by the many dramatists who have won laurels for Mexican literature since the overthrow of Spanish domination in 1821. His subjects are always full of interest and wide in range; his plots are skilfully constructed and his dramas have that broad human sympathy which ever appeals to mankind. He has successfully blended popularity of style with depth of thought and keen analysis. Three other dramatists belong to this period, Juan Menceslao Barquera (1779–1840), Anastacio Ochoa (1783–1833) and Francisco Ortega (1793–1849). Of these Ortega is the best. Both he and Barquera were journalists of note and saw many sides of life, which they both reflect in their dramas. Being journalists they were also naturally political writers, both of great power and influence. Ortega wrote heroic odes, love poems, sacred songs, sonnets fables, epigrams and stories of a political cast. His dramatic works are 'Camatzin,' a drama; 'The Mysteries of the Print-shop,' a comedy; and 'Freedom of Mexico,' a melodrama. Among Barquera's successful dramas, all of which were produced in the capital, are 'Polly Baker,' 'The Seducer,' 'Triumph of Education,' 'The Proxy's Love,' 'The Orphan Girl of Tlalnepantla' and 'Don Alfonso.'

Manuel Sánchez de Tagle (1782–1847) shares with Lizardi the honor of forming the connecting link between Mexican literary activity under Spanish rule and the revolutionary literature that followed. He is noted for naturalness, simplicity and regularity of metric forms. He is fond of the ideal, the mystical; he is poetically religious and he looks upon the

actions of men and the deity alike as ruled by an inexorable destiny, which recalls the Latin fates. His plots are simple in construction and development and he is free from affectation and the excessive poetical adornment which distinguish the preceding age. José Joaquín Pesado (1801–61), José M. Heredia (1803–39) and Manuel Alpuche (1804–41), contemporaries of Tagle, and very active during the stirring years that followed the establishment of the republic, paved the way for singers more distinctively Mexican in sentiment, subject and treatment. Of these the greatest is Pesado, who, in his day, enjoyed, in the mother country, the reputation of being "a new star on the horizon of Mexican literature." Among his admirers were the Spanish poets Zorilla, Martínez de la Rosa and Herreras. Purity of language, careful choice of words and expressions, vividness of thought and classical restraint are characteristics of Pesado's work. But it is with Jesús Díaz (1809–46) and Fernando Calderón (1809–45) that the real spirit of Mexico, as a new nation, begins to manifest itself. To Calderón is due the honor of creating for Mexico a national drama. He often went afield for his subjects when he might have found better at home; yet, inasmuch as he pointed out the way which others subsequently followed, his work is of great importance in any review of Mexican literature. Among his dramas are 'Reinaldo and Elina,' 'Zadig-Zeila,' 'Armandina,' 'Modern Politics,' 'Ramiro Count of Lucena,' 'Infigenia,' 'Hersilia and Virginia,' 'None of the Three,' 'The Tournament,' 'Anne Boleyn' and 'Herman.' Ignacio Rodríguez Galván (1816–42), a lyric and dramatic poet of great power, imagination and passionate utterance, has left two dramas distinctly Mexican, 'Muñoz' and 'The Private Secretary to the Viceroy.'

From the days of the revolution against Spain to the present, the literary life of Mexico has been wonderfully active and varied. To the vanguard who breathed the breath of life into this national literary activity belong José M. Esteva (1818–98), Ignacio Ramírez (1818–79), Guillermo Prieto (1818–94), Manuel Payno (1822–89), José T. Cuellar (1823–93). Augustín Rivera (1824–1913), Joaquín García Icazbalceta (1825–94), Antonio García Cubas (1832–96), José M. Vigil (1829–1908), José M. Roa Bárcena (1827–1906), Isabel Prieto de Landazuri (1833–76), Ramón Aldama (1832–92), Ignacio M. Altamirano (1834–93), Eduardo Ruiz (1832–1906), Vicente Riva Palacio (1832–96), Luis G. Ortiz (1835–94), Melisio Morales (1838—) and Rosas Moreno (1838–83). Esteva gave a distinctly national note to his work and painted truthfully and with considerable humor, pathos and vividness, the customs, habits and peculiarities of the Mexican people, with whom he was very popular. Ramírez and Prieto, though very far apart in many respects, may be classed together on account of the unity of their aims and the strong influence they had over the Republican party and democratic Mexico. They were both firebrands of the revolution that finally swept away all the privileges of the Catholic Church, confiscated and nationalized its property and drove the French out of Mexico. Both were noted orators and their poetry takes a decidedly oratorical caste. Ramírez plays so successfully upon all the strings of the human heart that his admiring countrymen call him "The Necromancer." Prieto is the master spirit of republicanism in Mexico. His is the loudest, surest, most-compelling voice crying out in behalf of the people during the long struggle against privileges, entrenched abuses and foreign intervention. He had a way of going right to the hearts of the people whose idol he was; and for whom he was the first to form traditions of national glory. He summoned them out of the darkness of their internecine struggle and bade them listen to the voice of their mother-land. He called up the Mexican heroes of the past and crowned those of his own age with laurels of glory. Possessed of the true poetical fires, he set the nation aflame in an age when the passions of men were easily stirred. He was lyrical poet, romancer, political writer and chronicler. His best-known work is 'El Romancero Nacional.' Payno was political writer, biographer, historian and novelist. He was very prolific. His best novel is 'The Devil's Scarf Pin' and his history of the war between Mexico and the United States is a good presentation of the Mexican side of the question. Cuellar, an excellent comedy writer and novelist, was very successful on the stage. Among his dramatic pieces are 'The Art of Love,' 'Old Man Chacón,' 'Poor Boys,' 'Griefs and Sacrifices' and 'Natural and Figura.' Among his novels and stories are 'Salad and Chicken,' 'Chuchu,' 'Gobina,' 'Old Maids,' 'People who are Just so' and 'Gabriel the Locksmith.' Many of his most successful stories appeared in the 'Magic Lantern Series.' Isabel Prieto and Aldema were also successful and popular dramatists. The latter, who was poet, journalist and political writer, and inclined strongly to the melodramatic, has left numerous dramas, of which the most popular are 'A Noble Heart,' 'Pledged to Vengeance' and 'Head and Heart.' Isabel Prieto is the most noted woman dramatist of Mexico; she is also an excellent lyrical poet. Among her dramas are 'Both are the Worst,' 'Two Flowers,' 'Abnegation,' 'A School for Sisters-in-law,' 'Gold and Tinsel,' 'A Type of the Day,' 'Thorns of Sin,' 'A Woman's Heart,' 'Fairy and Seraphim,' 'Carnival Night,' 'Sin and Penitence,' 'A Lily Among Thorns' and 'The Angel of the Hearth.'

José M. Roa Bárcena is the best short-story writer of Mexico and much of his work has been translated into French, Italian and English. He also wrote several novels. His 'Legends of Mexico' and his 'Recollection of the American Invasion' are well and carefully written. His short stories display a saving sense of humor, keen analysis of character and excellent constructive ability.

Altamirano and Riva Palacio stood beside Prieto and Ramírez in their glorification of republican Mexico. The most popular work of the former, who was a full-blooded Indian, is 'Landscapes and Legends.' Palacio, who was a noted republican general, filled many high public offices. He was a successful dramatist, poet, novelist, critic and writer of short stories, legends and political articles. With Palacio and Altamirano may be classed Peón y Contreras and Juán A. Mateos, who both dug deeply into the rich mine of national life and recounted the glories of Mexico. Novels, lyrics,

narrative poems, dramas poured from the pen of Peón y Contreras as if by magic; for several years he held the centre of the stage in the national capital where his dramas were wonderfully popular; while at the same time his metrical romances were read with avidity throughout the length and breadth of the land. 'Unto Heaven,' a drama produced in 1876, may be said to have made him famous over night. This was followed by many other dramas, which were produced in the capital as fast as the author could turn them out. Several of these were also successfully presented on the Madrid stage. Mateos, who has strong imagination, intensely oratorical, form and wonderful facility of expression, naturally turned to the drama; and the capital welcomed him as it had already welcomed Peón y Contreras; and he wrote at the bidding of the public drama after drama, most of which were successful. Ireneo Paz also wrote successful dramas and comedies and the Mexican capital welcomed him too; and when Chavero came along and repeated the act, he also was received with open arms. Thus Mexico City became the centre of a strong dramatic movement, in some ways superior to the great dramatic movement that produced the *autos* and religious and other dramas of the previous centuries. These 19th century Mexican dramatists were all men of many parts. Mateos was his country's greatest romancer and historical novelist, Chavero was archæologist, epic poet, historian and critic of the first rank, while Paz was journalist, political writer, novelist, historian and humorist. Meliseo Morales wrote good lyrical dramas which were staged in Italy; and he translated popular Italian operas into Spanish for Spanish playhouses. Icazbalceta and Pimentel worked together. The former dug into the countless records of the past of America hidden in the many libraries of the republic and gave to light a long list of valuable documents for the history of Mexico. He also wrote much good original matter along the same line, a 'Political History of the Indies,' 'Mexico in 1554,' 'Mexican Biography of the Sixteenth Century,' 'Zumarraga,' a 'Dictionary of Mexican Provincialisms' and 'Mexican Physicians of the Sixteenth Century.' Pimentel worked in the same library and produced, among other works, the best 'History of Mexican Literature' extant.

Rosas Moreno disputes with Lizardi the honor of being the most successful Mexican writer of fables. His work has become a classic in Spain. Ruiz, an excellent raconteur of legends; Ortiz, a fair poet and novelist, and Rivera, a voluminous historian, may be said to complete this period, though the latter lived on into the 20th century and was the nation's honored guest at the opening of the National University in 1910. His long life of tireless and ceaseless literary activity enabled Rivera to produce over 100 histories, critical works and booklets. Ruiz is best known by his 'Legends of Michoacan' and 'Traditions and Legends.' The connecting link between the literary activity of the Diaz régime (1876–1910) and that of the preceding years of the life of the republic is Manuel Acuña (1849–73) who, notwithstanding his short life and tragic death, exercised a wonderful influence upon the poets who followed him. He was endowed with vivid imagination and a strong literary and poetic sense which reminds one somewhat of Poe. Ignacio Montes de Oca (1840—), Manuel Gutiérrez Nájara (1850–95), Salvador Diaz Mirón (1853—), Juán de Dios Peza (1852–1909), Manuel José Othón (1851–1908), Luis G. Urbina (1868—) and Justo Sierra (1848–1911) are all names that shed lustre on Mexican literature. Flores is an epic bard with strong histrionic and dramatic talent. Gutiérrez, Nájara and Sierra are both excellent poets and writers of talent in other fields, and Othón and Urbina are among the most popular singers of the present century in Mexico. But of the writers of the Diaz régime, Peza is by far the best and most popular. He published three dramas, 'A Love Affair,' 'A Real Home' and 'Columbus' which became popular. But it is his simple, heartfelt, almost homely poems that made him the literary lion of the Mexican capital. Among these are 'Songs of the Hearthstone,' 'The Arrow of Love,' 'Home and Country,' 'Flowers of the Soul,' 'Memories and Hopes,' 'Monologues and Songs of Heroes,' Mexican Traditions,' 'The Mexican Lyre,' 'The Harp of our Native Land' and 'Legends of the Streets of Mexico.' Mirón, who is called the poet of poets, has great breadth of imagination, a deep sense of the beauty of rhythm and imagery and decided lyrical talent. Carlos H. Serán made comedy and native vaudeville popular in Mexico.

Modern Literature.— The period of the Díaz administration was prolific in writers of talent in every line of literary endeavor, to such an extent that even a cursory review of their activities would far overpass the limits of this article. Antonio Zaragoza is the author of several volumes of fervid lyrical poetry. Francisco F. Icaza, whose work is chaste and classical in form, has been welcomed in Spain as at home. José M. Bustillos has taken up the song of the glories of the Mexican race and has gone back to the days of the Indian empires for many of his subjects, plots and characters. 'Rocks of the Lake' is his best work. Zayas Enriquez, biographer, historian, poet and essayist, is a talented but not over-conscientious writer. Enrique Fernández Granados, correct in style, artistic in temperament and classical in aims, has published two volumes of excellent poetry, 'Myrtles' and 'Daisies' and made excellent translations of Italian poetry into Spanish. Joaquín D. Casasús (1858–1916) and Julio Guerrero are distinguished writers on political and social subjects. Casasús also did other good literary work and translated Longfellow's 'Evangeline' and Horace's 'Odes' into Spanish verse. Guerrero's 'Genesis of Crime in Mexico' is an illuminating analysis of Mexican character, conditions, customs and tendencies. Juán José Tablado, Oriental in the richness of his imagination and the depth of coloring he imparts to his images, has the true lyric ring. He and Jesús Valenzuela and Amado Nervo form a trio of brilliant young newspaper men who have found warm welcome in all Latin-American countries and in Spain herself. Balbino Dávalos has published a book of poems and made excellent translations into Spanish from English and French; but his work has less imagination than that of the trio above mentioned.

Francisco Bulnes and Luís González Obre-

gón are both historical investigators of note and brilliancy. Bulnes is oratorical, passionate, picturesque, vivid. Obregón is cool, collected and severely impartial. He lacks the warmth of imagination of Bulnes and the passion which produces highly-colored pictures; but he sees clearly and illuminatingly into the past and lays it before us in all its nakedness. His published works make a long list, the best known of which is 'Old Mexico.' Bulnes' 'The True Juárez,' convincing though it is, raises a storm of protest from Mexicans all over the land.

The Ishmael of Mexican literature is Antonio Plaza. He has been damned by the educated as vulgar and unchaste; the Church has accused him of paganism and blasphemy and the critics have taken delight in stabbing him; yet, next to Juán de Dios Peza, he has long been the most popular poet of the Mexican middle class. Plaza is a soul in revolt against the world as he found it. He has a wonderful power of invective and the language to fittingly express it; and yet, at times, he reveals a tenderness through which shows the tortured soul behind all his railings.

Among the talented women writers of Mexico are Heraclia Badillio Dolores Guerrero, Teresa Vera and Josefina Letechipia, who have covered practically the whole field of Mexican literature.

Historical investigation has always attracted Mexican literary men. This is due to the romantic interest of the country and its great wealth of material relating to the native races, to the Conquest and to the period of Spanish occupation immediately following. The most noted historical writers of the 17th century are Francisco de Burgoa, 'Account of the Dominicans' (1597); Alonzo Franco y Ortega, Fernando de Alva Ixtlixochitl, Augustín de Vetancurt, 'Teatro Mexicano'; Antonio Tello, 'History of New Galicia' (1650); Antonio de Solís (1610–86), 'History of Mexico'; and J. Villagutierrez Soto-Mayor, 'History of the Conquest of the Mayas.'

The historians of the 18th century have left more pretentious, better arranged and more philosophical histories and pictures of Mexican life than their predecessors. Of these historians the most trustworthy are Francisco Javier Alegre (1729–88), 'History of the Jesuits in New Spain'; Lorenzo Boturini Benaducci (1702–50), 'General History'; Andrés Cavo, 'Spanish Government in Mexico' (1766); Francisco Saverio Clavijero (1731–87), 'Ancient History of Mexico'; Granado y Gálvez, 'Indian History'; Antonio Lorenzana, 'History of New Spain' (1770); José Beristain (1756–1817), 'Biographies' and Mariano Veytia (1718–79), 'Ancient History of Mexico.'

The 19th and 20th centuries of Mexican historians include Lucas Alamán, Marco Aroniz, Carlos M. de Bustamante (1774–1848), Antonio García Cubas (1832–96), Luís González Obregón, Ignacio M. Altamirano, Diego de Landa, Nicolás León, Joaquín García Icazbalceta, Manuel Orozco y Berra (1816–81), Carlos Pereyra, Anselmo de la Portilla (1816–79), Pantaleón Továr, Eufemio Mendoza, Eduardo Gallo, José María Vigil, Augustín Rivera (1824—), Manuel Rivera Cambas, Francisco Sosa (1848—), Justo Sierra, Niceto de Zamacois, Manuel Payno (1810–94), Genaro García, Victorio Salado Álvarez, Edurado Ruíz, Manuel Santibañez, José María Iglésias, Fernando Iglésias Calderón, Vicente García Torres, Antonio de León y Gama, Manuel Revilla and José Victór Martínez (1810–61).

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17. HISTORY. Pre-Conquest Period.— The history of Mexico divides itself into three parts: aboriginal Mexico under the domination of its native Indian rulers, from the border land of prehistoric times to 1521; Spanish occupation from 1521 to 1821 and independent Mexico from 1821 to the present.

A score of distinct aboriginal tongues and more than 100 dialects still spoken within the confines of the Mexican Republic are evidence of the presence of numerous races that overran the country at various periods during its prehistoric existence. These early races seem to have had considerable influence upon the traditions, mythology and customs of the people who followed them in the country. From the confused movement of the shadowy peoples of the past stand forth the forms of several more or less distinctly cultured races whose written and traditional records, legends and folklore reach back to the dim border land beyond which all is mythical. During the early semi-historical part of this period the great Nahua race, beginning its many years of wandering from the north, crossed the Mexican boundary in the 6th century and continued southward. These migrations were participated in by numerous tribes or nations. The first of these, the Toltecs, came from the semi-mythical land of Old Tlapallan under the leadership of their high priest and chief, Heumatzin, he of the big hands, and arrived at Tulancingo (a short distance north of Mexico City) in 720, after 176 years of wandering. Soon afterward they established populous centres at Tula, San Juan, Teotihuacán, Cholula and numerous other places and extended their power over a wide reach of country. They are said to have been a highly civilized race, to have been builders of great and handsome cities and to have extended organized commerce for hundreds of miles beyond their own territory which, at the height of their power and prosperity, stretched from the Gulf of Mexico to the Pacific and far southward to the border of the domains of the Maya of Yucatán, Chiapas and Campeche. They had a settled form of government and

complicated, far-reaching codes of law which included military, political, social and religious regulations; and these, in their turn, were supported by racial customs and dogmas. See MEXICO — MYTHOLOGY; MEXICO — LITERATURE.

While the Nahua held the central portion of what is modern Mexico, the Maya and other kindred races occupied the south, stretching from Campeche, Yucatán and Chiapas south and west to the Pacific and into Guatemala, where they established a civilization rivaling that of the Toltecs. Between the Maya on the south and the Toltecs on the north lay the Zapoteca and the Mixteca, almost as far advanced as they in the arts and sciences and the principles of government. All four peoples were skilled workers in metals and excellent makers of pottery and woven fabrics. They recorded their histories, traditions, religious formulas, tribute rolls and important events in complicated hieroglyphics which varied with the different races. They were good agriculturists, excellent builders and organizers and they maintained extensive and well-apportioned armies and systems of public instruction. All education was in the hands of the priests and administered from the temples, thousands of which, rising from high, truncated, pyramidal structures, covered the land. These temples were specially numerous and of notable magnificence in the Aztec land and Yucatán. See MEXICO — ARCHITECTURE; MEXICO — ART.

Civil wars, internal dissensions, famine and plague are given as the causes of the disruption of the Toltec empire which came to an end in 1116, after nearly 400 years of existence. A part of the Toltec population is said to have migrated southward and to have entered the land of the Maya. It is certain, however, that many remained behind and lost their identity in the Chichimeca and other less cultured races who occupied the valley of Mexico and surrounding country. From this union sprang the famous Texcocans, whose capital, Texcoco, on the lake of the same name, preserved the civilization of the early Nahua and finally became the most noted centre of culture in the Mexican empire.

The Aztecs, Texcocans, Tepanecas, Chalcos and Tlaxcalans are the most notable of the Nahuatl tribes who took possession of the country deserted by the Toltecs. Of these the most important are the Aztecs, who began their wanderings from Aztlán, their old home in the north, about a century after the Toltecs. Six hundred years later they arrived in the valley of Mexico, where they eventually, after many struggles and privations, established themselves on two little islands in Lake Texcoco, and founded their capital, Tenochtitlán, the Place of Tenoch, their priestly leader and mighty warrior, or Mexico, the Place of Mexitli, their war god.

The Aztecs prospered, grew in numbers and extended their power over the Chalcos and other tribes bordering on the lakes of the valley of Mexico and, forming an alliance with the Texcocans and the Tepanecas, carried their conquering arms from the Gulf of Mexico to the Pacific and, from some distance north of Mexico City, southward past the Isthmus of Tehuantepec almost to the border of modern Guatemala, where they encroached upon the land of the Maya. The creation of this vast empire which, in extent and power, outrivaled that of the Toltecs, was due to the skill, intelligence, executive ability and warlike prowess of a line of kings which began with Acamapixtzin, Prince of the Reeds (1376–1404), 50 years after the founding of Tenochtitlán. The other Aztec rulers in succession, up to the arrival of Cortés, were Huitzilihuitl, Hummingbird's Feathers (1404–17), Chimalpopoca, Smoking Shield (1417–27), Ixcoatl, Obsidian Knife (1427–40), Moctezuma I, Wrathy Chief (1440–69), Axayacatl, The Fly (1469–81), Tizoc, Lame Leg (1481–86), Ahuizotl, Water-rat (1486–1502) and Moctezuma II (1502–20), all of whom worked zealously for the upbuilding of the Aztec empire and the beautifying and extension of their capital.

From the beginning of the reign of Moctezuma II, Spanish navigators had been exploring the neighborhood of the Mexican coast and several had touched on the mainland of Yucatán and Campeche. In 1519 Hernán Cortés, inspired by the dream of conquering a great and rich land, of which reports had been brought to Cuba, set out with a small military force on his daring expedition to the uplands of Mexico. On the way he defeated the Tlaxcalans, an independent nation, and the Cholulans, who formed a semi-dependent province of the Aztec empire. From these he recruited a considerable native army, with which he continued his march to Mexico City, where he was reluctantly received by Moctezuma II and quartered in one of the royal palaces. He finally succeeded in making a prisoner of the Aztec ruler, who was killed a short time afterward (30 June 1520) either by the Spaniards or by the Mexicans themselves. The presence of the Spaniards in the city, the death of the emperor and the profanation of the shrines of their deities enraged the Aztecs to such an extent that they rose against Cortés and he was forced to leave the city by night. In the retreat he lost his cavalry, artillery and most of his infantry. After recruiting a new army and obtaining additional war equipment, Cortés returned and laid siege to the City of Mexico which he captured (13 Aug. 1521) and afterward continued the conquest of the domains of the Moctezumas.

Under Spanish Rule.— Immediately after the surrender of Tenochtitlán the government of Mexico fell into the hands of the conquistadores who, being purely military governors, administered the affairs of the land by means of military law. Gradually the large cities were granted local government similar to that of Spain and the province was divided into districts controlled by the central government in Mexico City. In 1528 auditors (*oidores*) were introduced to keep a check on the captain-general, Cortés. They soon succeeded him and continued to govern the country until 1535, when Antonio de Mendoza became the first viceroy. He was a very earnest and capable man and at once proceeded to replace with an orderly and settled form of government the hap-hazard methods of the oidores and military leaders.

Spain monopolized the trade of Mexico, or "New Spain." Commerce to and from the colony could be carried only in Spanish bottoms; nothing was permitted to be grown in Mexico that might in any way come into com-

petition with products from Spain. Only native-born Spaniards could hold office under the government in New Spain. The establishment of manufactures of all kinds was discouraged or prohibited. Yet Spain gave her colonies a strong government and one that was thoroughly understood by the mass of Indians and mestizos who composed the greater part of the population of Mexico, for it was much like the kind they had been accustomed to for centuries under their native rulers. The encouragement of literature and art, the beautifying of the cities and towns, the extension of great highways of commerce, the improvement of harbors, the establishment of high schools, colleges and a provincial university and the practical eradication of the native religion with its human sacrifices were far-reaching benefits which Spain bestowed upon Mexico. But the evils of her administration outran the good. The establishment of peonage and the concentration of the Indians in centres, towns, camps or ranches under the pretense of civilizing and Christianizing them soon destroyed all the machinery of the native civilization. The masses of the population, their aboriginal laws and codes of morality gone by the board, soon lost their pride of race and descended to a condition of slavery bringing with it debauchery, a loss of interest in life and a consequent loss of ambition. These and scores of other abuses created discontent throughout the viceroyalty, which was destined to show itself in vigorous protests and insurrection against Spanish authority. An unsuccessful revolutionary plot in the capital in 1808 was followed by the uprising of Hidalgo, the patriot priest of Dolores, on 16 Sept. 1810. Hidalgo, after a wonderfully successful initial campaign which brought him, with an army of 100,000, almost to the gates of the capital, was finally defeated, captured and executed the following year. The war of liberation dragged on with varying success until 1821, when the life of independent Mexico began.

Independent Mexico.—The first government of independent Mexico consisted of a council of six, with Gen. Augustín Iturbide, the commander of the revolutionary army, as president. On 19 May 1822 Iturbide was proclaimed emperor, and on 21 July he and his wife were crowned in the cathedral of the capital. But dissensions soon set in and Iturbide was forced to abdicate and to leave the country. On returning to Mexico in 1824 he was arrested, tried and shot as a traitor. Then followed many kaleidoscopic political changes in which the personal ambition of military leaders played the foremost part.

Santa Anna, who became President in 1833, and who was looked upon as a good soldier, took the field against the Texas revolutionists with an army of 6,000 trained men. Successful at first, he was defeated in 1836, captured and taken to the United States, but was allowed to return to Mexico the following year. For more than a generation, from the first days of the republic to the middle of the 19th century, the figure of Santa Anna appears ever in the foreground of the political life of Mexico guiding the destinies of the nation or watching political moves from either voluntary or forced retirement. Shortly after his return from the United States the French government sent a squadron to Vera Cruz to enforce the payment of claims against Mexico held by French citizens. Santa Anna, who had gone into one of his periodical retirements, came forth and placed himself at the head of a force to oppose the French, who finally withdrew. Santa Anna claimed the honor of having driven them from the country. This claim and the fact that he lost a leg in the encounter made him once more a national figure and a popular hero, although Mexico had been forced to comply with the French demands.

Bustamante, recalled from exile, became President in 1837, on the outbreak of the revolution in Texas. The struggle between ambitious military leaders became more intense. Santa Anna, Paredes, Bustamante, Farías, Herrera, Nicolás Bravo and others played their several parts on the constantly changing stage. The admission of Texas to the American Union as a State, 29 Dec. 1845, roused the resentment of Mexico against the United States to a high pitch. James K. Polk, who succeeded Tyler as President of the United States, was an ardent expansionist and included in his plan of expansion the acquisition of California, Arizona and New Mexico, then Mexican territory. Claims amounting to several million dollars were held by American citizens against the Mexican government, which was unable to meet them. Polk proposed to settle these claims in exchange for Mexican territory, paying, in addition, to Mexico $25,000,000 in cash. In November 1845, John Slidell was sent as diplomatic representative to Mexico City, with instructions to press the matter of cession of Mexican territory to the United States. But the Mexican authorities, having learned in advance of Slidell's commission, did not receive him. Polk was ready to ask Congress to declare war against Mexico in May 1846 when the news reached Washington that armed Mexicans had already crossed the border and killed a number of Americans. War was declared against Mexico, 13 May. General Taylor, in command of American forces on the Rio Grande, was ordered into Mexico. In September 1846 he defeated a Mexican army and captured Monterey and, on 22 February, he fought a drawn battle at Buena Vista (Angostura). A month later Gen. Winfield Scott arrived at Vera Cruz, which he captured, 29 March, and began the long and toilsome march toward the upland plateau and the capital of Mexico, which he reached six months later. After the capture of Molino del Rey, Churubusco and Chapultepec, fortresses defending the capital, Scott's army entered the City of Mexico. In the meantime American forces had taken possession of California and New Mexico without opposition. In February 1847 a treaty was signed at Guadalupe Hidalgo, near the Mexican capital, between representatives of Mexico and the United States by the provisions of which California and New Mexico were ceded to the United States.

Santa Anna, who had again become dictator of Mexico while the country was at war with the United States, retired to Jalapa, and General Herrera became President, 3 June 1848. He was succeeded (January 1851) by General Arista, who was forced out of office by Santa Anna.

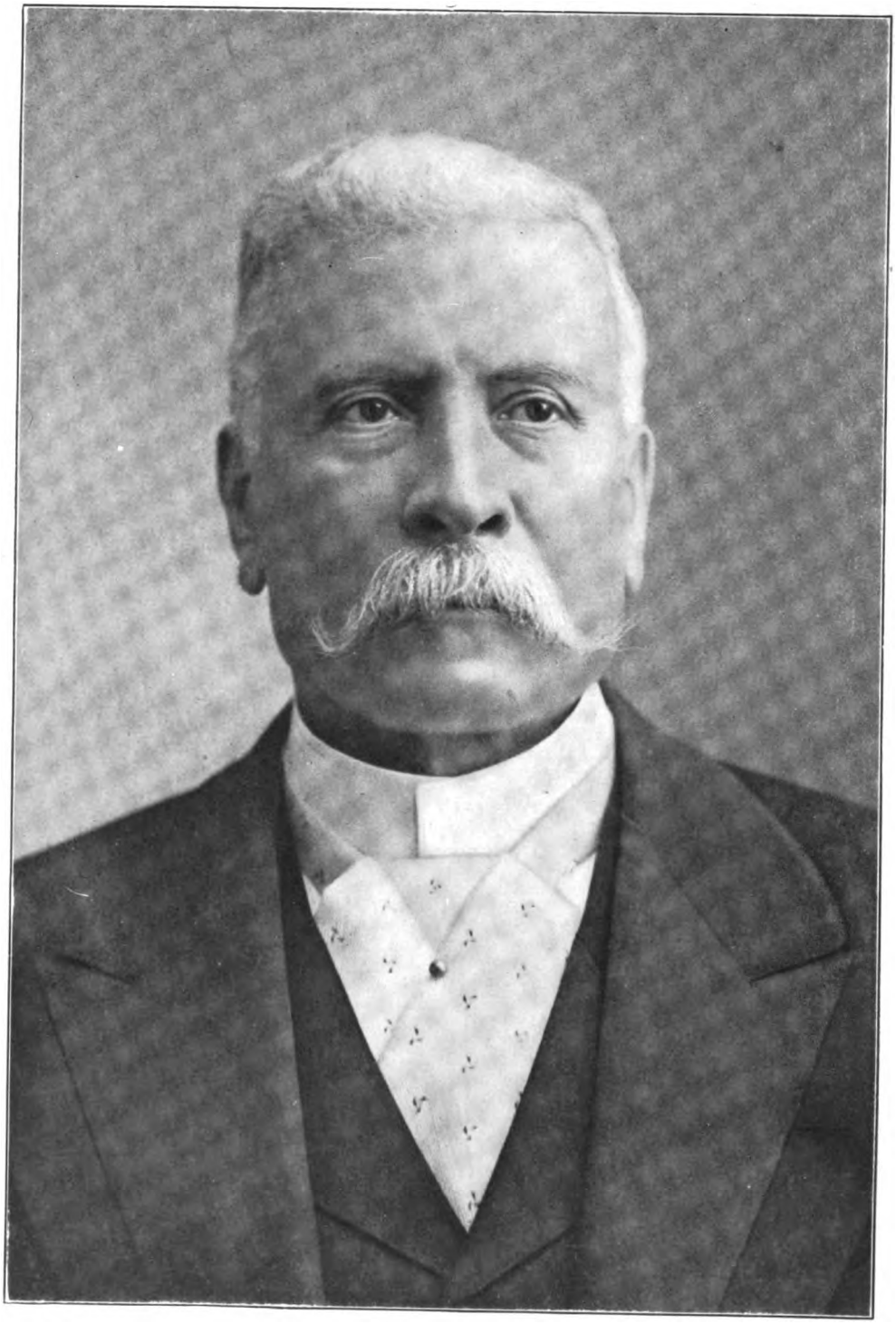
A new constitution for the republic which

became law on 5 Feb. 1857 figured in every Mexican conflict during more than half a century. President Comonfort repudiated it, thus estranging his own following without gaining the support of his opponents. He was forced to flee the country, and his departure gave rise to internal dissensions not finally settled for years. Benito Juárez, president of the Supreme Court, claimed the presidency in accordance with the provisions of the Constitution. War divided the people and devastated the land and the reactionary party forced Juárez from the capital. In the midst of all this civil trouble, a real danger threatened the republic from without. In 1861 England, France and Spain entered into an agreement known as the Treaty of London, by which they were to send a three-fold fleet to Vera Cruz to demand of Mexico guarantees for the payment of her foreign debt and for the safety of their subjects in Mexican territory. This fleet, which appeared at Vera Cruz on 8 Dec. 1861, captured the port and proceeded to Orizaba, where a conference was held with Juárez, who agreed to comply with the demands of the powers. England and Spain at once withdrew their troops from the country. But the French, who had a secret understanding with the Mexican reactionary party, at the head of whom was Miramón, who had disputed the presidency with Juárez, remained in Mexico with the avowed purpose of settling its social and political difficulties. The French army soon began its march toward the uplands, but it was defeated before the walls of Puebla and forced to retreat to Orizaba (1862).

The Archduke, Maximilian of Austria, and his consort, who had been selected by Napoleon III as emperor and empress of Mexico, arrived in Vera Cruz 24 May 1864. In the capital they were welcomed and crowned with great ceremony. The protest of the United States forced the withdrawal of French troops from Mexico, and Maximilian, left to his fate, was compelled to surrender at Queretaro in 1867. He was tried, found guilty of treason to the Mexican people and shot on the Hill of the Bells near Queretaro, together with his two generals, Miramón and Mejia, 19 June 1867. The concerted action of the Army of the North under Escobedo and the Army of the East under Porfirio Díaz defeated the Imperialists; Mexico City surrendered to Díaz 21 June, two days after the execution of Maximilian; and on 15 July Juárez returned to the capital amid the rejoicing of the populace. But opposition to the Juárez government soon developed and his administration was troubled by constant uprisings and disaffection. Juárez died suddenly 19 July 1872, shortly after he had been re-elected President. He was succeeded by Sebastian Lerdo de Tejada, who served one term and was forced out of office shortly after his re-election by Gen. Porfirio Díaz who defeated the Lerdist party at the battle of Tecoac, marched upon the capital and was there proclaimed provisional President, 24 Nov. 1876, and later constitutional President. At the expiration of his term of office, 30 Nov. 1880, he was succeeded by Gen. Manuel González, who continued the Díaz policy of encouraging the construction of railways and increasing the efficiency of the rural police charged with the protection of the country from revolutionary and robber bands.

Díaz succeeded González in the winter of 1884, and, for more than a quarter of a century, he continued to be the one great power in Mexico. He found the country in debt and the income of the administration inadequate to meet the demands on it. He increased the revenue of the nation over 400 per cent; he built railways, highways, roads and harbors; he drained the valley of Mexico and made the pest-ridden coast towns places of resort. He encouraged foreigners to settle in or invest in the country and to contribute their part to his program of expansion and development, and he created a credit for the nation and steadily increased and improved it. He introduced system and encouraged honesty in the public service and prevented, to a very great extent, malversation of public funds, which had been so noticeable during previous administrations, by the introduction of a rigid and modern system of accounting and by holding the heads of the departments accountable for the funds passing through their hands. With Díaz the Indian and mestizo elements, constituting fully 85 per cent of the population, began to come into their own. Thus a new social life was created in Mexico under his régime, and in it the mestizo, for the first time, began to play a prominent part.

Díaz found public instruction neglected and practically non-existent and he set to work to remedy this defect. Training schools for teachers were established and the higher schools and colleges were increased and improved with a view to supplying, through them, the teaching body for new primary and secondary schools. Though lack of funds hampered this work, the results achieved bore fruit in the rapid increase of the standard of intelligence in the larger towns and cities. Under Díaz the resources of the country were developed; commerce threw off its provincialism and became national and international, and new industries sprang up throughout the land. But, with a government which had absolute control of the affairs of the country so long as that of Díaz abuses were bound to creep in. About the President had grown up a strong personal party, the members of which, while professing great admiration for him and his government, succeeded in enriching themselves, [redacted] and friends through concessions [redacted] secured through their close connection with the administration. The spread of public instruction and the rise of the Indian and mestizo to public prominence introduced into [redacted] equation a new and restless element [redacted] had constantly, throughout his long régime, to curb, control and discipline. The discontent increased; Mexican exiles in the United States used every means in their power to hasten the overthrow of the man they characterized as autocratic and tyrannical. Ramón Corral, the Vice-President, who was looked upon as the leader of the sinister influence at work in the party surrounding the President, was singled out as the special object of attack of the anti-government agents. Díaz, in the face of the impending storm, supported Corral, who was re-elected in 1910. During the month of September 1910 the 100th anniversary of the declaration of Mexican independence was celebrated



General Porfirio Diaz

throughout the republic with great pomp and ceremony and special representatives of foreign nations gathered in the capital to lend dignity to the occasion. But scarcely had the month of national rejoicing ended when political unrest began to show renewed activity. Francisco I. Madero, who had presented himself as a candidate for the presidency in opposition to Díaz and had been arrested on the charge of sedition and finally released from prison and ordered to leave the country after the elections had been held, furnished the necessary leader to the Liberals in the United States and their many sympathizers in Mexico. The active revolutionary propaganda already begun was intensified, and agents of the insurgent party spread their doctrines throughout Mexico and induced uprisings in Vera Cruz, Puebla, Chihuahua, Durango and other cities and towns of the republic; and, as Medero crossed the border to head the insurgents, similar outbreaks took place south of Mexico City, while revolutionary bands gathered in force in the north near Torreón, Gómez Palacio and Parral. The inauguration of Díaz as President (1 Dec. 1910) increased the revolutionary centres and quickened their activities, thus compelling the government to weaken its strength by distributing its forces over a large and constantly increasing area of territory. Radical changes were effected in the Díaz Cabinet and attempts were made to meet the demands of the revolutionists, as American troops were ordered concentrated along the Mexican border; for this move was taken in Mexico to mean a threat of intervention. The government offered to enter into peace negotiations with the insurgents, but attempts made to this end proved abortive and were suspended 6 May. Juárez fell to the insurgents 10 May, and Díaz, urged to save the country from further bloodshed and the danger of intervention, resigned, 25 May, and was succeeded in office by Francisco de la Barra, Secretary of Foreign Affairs, as President *ad interim* pending an election. Two weeks later Madero entered the capital where he was enthusiastically received. So powerful was his influence that the de la Barra administration was forced to consult him in every important move made. On 15 ~~November~~ Madero was unanimously elected President of Mexico; but scarcely had he assumed office when opposition began to develop and revolutionary intrigue to show itself within his own party. Zapata revolted in Morelos and Gen. Bernardo Reyes attempted an unsuccessful insurrection. Gen. Pascual Orozco, one of the foremost revolutionary leaders, rebelled and captured Juárez 12 Feb. 1912. Gen. Félix Díaz took Vera Cruz, but was himself captured, tried and condemned to be shot — a sentence which was commuted to confinement in the penitentiary near Mexico City. In the meantime Madero found himself unable to control those who surrounded him, to establish a stable government or to carry out the promised reforms.

General Mondragón, backed by his own troops and the students of the Military Training School at Tlapam, a suburb of the capital, rose against the government, 9 Feb. 1913, marched to the military prison and set free General Reyes, and from there to the penitentiary and liberated Gen. Félix Díaz. Practically unopposed the three generals entered the capital, where Reyes was killed in an attack on the National Palace. The revolutionists seized The Citadel, a strong fortress and ammunition depository, while the Madero forces took possession of the National Palace, Chapultepec and other points in and around the city. Both factions bombarded one another almost continuously for 10 days, when Gen. Victoriano Huerta, commander-in-chief of the government forces, brought the conflict to a dramatic close by the seizure of President Madero and Pino Suárez, the Vice-President, who were forced to resign their respective offices. Pedro Lascurain, Minister of Foreign Relations succeeded to the presidency. He appointed Huerta his minister of foreign relations and resigned in his favor. Thus, in one day Mexico had three Presidents. On the morning of 23 February Madero and Pino Suárez were murdered, presumably by agents of the Huerta government. For this act, Venustiano Carranza, governor of Coahuila, disavowed the new government and issued the Plan of Guadalupe which called for reforms in the administration, equitable taxation, extension of the educational system and the solution of the land problem (March 26). President Wilson dispatched John Lind to Mexico City as his personal representative with a view to bringing the opposing parties together; but Huerta's refusal to be eliminated as a presidential candidate and his arrest and imprisonment of 110 Congressional deputies and the forcible dissolution of Congress (10 and 11 October) made any compromise impossible. A new election held on 26 October, under pressure, resulted in the selection of Huerta as President. The new Congress, which met on 15 November, in view of a protest from Washington, declared void the election of the President and Vice-President but confirmed Huerta in the office of provisional President. The Constitutionalists determined to make no compromise with Huerta, and the war went on. Villa took Juárez 15 November; other important places fell and early in 1914 Villa captured Ojinaga, after the Federal garrison of 4,600 had retreated across the American border. Then turning southward he took Torreón in April, while Mazatlán and Tampico surrendered to the Constitutionalists in May, and Carranza set up his government in Saltillo.

Huerta found himself in constantly increasing difficulties on account of his defiance of the United States. These difficulties had culminated when sailors from the United States steamship *Dolphin* had been arrested in Tampico ~~10~~ April and marched through the city under armed guard. For this insult Admiral Mayo demanded that the Mexican government should order a salute to the American flag. This Huerta refused to concede; and President Wilson laid the matter before Congress 20 April, requesting authority to use the forces of the nation to enforce Mayo's demand. While Congress was debating this request American marines were forcibly landed in Vera Cruz to prevent the entrance at that port of a shipment of arms from the steamer *Ipiranga*. At this juncture Argentina, Brazil and Chile, known as the A B C powers, offered to serve as mediators. The offer was accepted and the diplomatic representatives of these powers at Washington met at Niagara Falls, Canada, 20

May to 24 June, without being able to find a solution for the troubled conditions in Mexico. On the day they adjourned Gonzáles took Zacatecas and, two weeks later, Obregón entered Guadalajara; and in July, San Luís Potosí, Manzanillo and several smaller places fell to the Constitutionalists. Huerta, forced to resign, 15 July, was succeeded by Francisco Carbajal, Minister of Foreign Relations, who at once entered into communication with the Constitutionalists and resigned in favor of Carranza, 13 August. Two days later Obregón took possession of the capital, where Carranza arrived on 20 Aug. 1914.

With the elimination of Huerta and the success of the Constitutionalists, bitter dissensions appeared in the heterogeneous elements composing the party. A convention of generals called to meet in Mexico City on 1 October served only to intensify the trouble and the convention was moved to Aguascalientes, where, dominated by Villa, it disallowed the claims of Carranza and elected General Gutiérrez provisional President. It was also decided to march upon Mexico City and compel Carranza to yield to the will of the Convention. In the face of this threatened danger, the latter went to Puebla and, from there, to Vera Cruz on the withdrawal of the American forces from Mexico 23 November. Zapata and Villa at once occupied the capital and Gutiérrez set up his government there (3 December). In January 1915 the Convention, disowning Gutiérrez, proceeded to govern Mexico City in its own name; but the approach of Obregón with a strong force compelled it to abandon the capital, which was occupied (28 January) by the Carranza commander, who, in turn, was forced to retreat before a Zapatista horde, 10 March. Two weeks later Villa recognized as convention provisional President Gen. Roque González Garza.

One of the dramatic incidents of the year was the siege of Naco, Sonora, by General Mayortena. Five Americans were killed and 50 or more wounded by shots coming across the border. Washington warned both the contending parties to refrain from firing into American territory. Early in January General Scott, representing the American government, and Villa held a conference at which it was agreed to withdraw the contending forces from Naco. In the meantime the Convention party was faring badly in the north. Guadalajara fell to Carranza and Villa was defeated at Celayo in March. Other disasters followed and finally Washington notified the Constitutional and Convention parties, 2 June, that unless peace was restored soon, the United States would be compelled to support some man or group of men capable of bringing order out of chaos. Meanwhile raids were being frequently made across the Texas border by bands from Mexico instigated from without Mexico by certain predatory interests, and finally, on the night of 9 March 1916, an armed band of Villistas attacked Columbus, N. M., killing eight soldiers and a number of civilians. Washington at once acted, 17 March, and sent into Mexico 12,000 troops under General Pershing with orders to take Villa dead or alive. Carranza refused a request from the American government for permission to ship, over the Northwestern Railway, supplies to Pershing's forces which were finally compelled to come to a halt at Parral, where several American soldiers were killed and others wounded in a surprise attack.

In April General Scott, chief of staff, who had been sent to the Mexican border to report to Washington on the situation, held a conference with General Funston, commander of the American forces on the frontier, and General Obregón, Mexican Minister of War. The latter insisted on the withdrawal of the American punitive expedition from Mexico, and this was conditionally agreed to, 2 May. Carranza, charging the American government with bad faith and asserting that the presence of United States troops in Mexico proved a constant source of irritation and weakened the hands of the Mexican authorities, refused to ratify the agreement. Washington replied by reviewing the course of events in Mexico and charging that the Mexican government apparently did not wish to see the border raiders captured. On 18 June the American militia was ordered to the Mexican border two days after General Treviño had been enjoined by Carranza to prevent the movement of the Pershing expedition in any direction except homeward and to oppose the entrance of further American troops into Mexico. In pursuance of this order an American force of some 90 troopers was attacked at Carrizal and a number of officers and troopers killed and 17 taken prisoners. On a peremptory demand from Washington the latter were released, 22 June 1916. Carranza began to show a more friendly front, and proposed the naming of commissioners by the American and Mexican governments to consider the issue between them, 12 July. This proposition was accepted and Luis Cabrera, Minister of Finance, Ignacio Bonillas, Minister of Communications and Alberto Pani, head of the National Railways, representing Mexico, met in New London, Conn., with Franklin K. Lane, Secretary of the Interior, Judge George Gray and Dr. J. R. Mott. After many subjects had been discussed Carranza declined to approve any form of agreement, and finally the troops of the United States were withdrawn from Mexico without having accomplished any definite result.

A constituent assembly whose members were chosen at elections supervised by the Carranza army met at Querétaro. That assembly made radical changes in the constitution of 1857 which were promulgated on 5 Feb. 1917 and went into operation 1 May 1917. This provided for the democratization of the Judiciary, free justice without court costs, and created a labor code providing for a minimum wage, compulsory profit-sharing, a free employment bureau and protection against trusts. It also provided for confiscation by the government of churches, schools and hospitals in the possession of religious bodies; and that all clergy be native born. A congress was elected and began its sessions on 15 April 1917, on which occasion President Carranza declared that the nation would continue to be neutral in the European conflict. During the European War many Germans fled from the United States to Mexico, and these were accused of fomenting trouble for the Entente. General charges were made in the United States and in Britain usually by capitalists interested in Mexican mines or their agents, that Mexico, notwith-

standing her proclaimed neutrality, was secretly encouraging the Germans. However, the connection of the Mexican government, if it ever existed, with this movement, has never been proved. From 1917 to 1919 there was friction between the Mexican government and the foreigners resident in the country over taxes and restrictions placed on mining and oil properties in the Republic, both of which national assets the government rightly aims at nationalizing and protecting from exploitation by predatory foreign corporations. In 1916 the national currency was rehabilitated so as to give it a recognized and regular standard of valuation. In 1919 President Carranza issued a public statement that, in conformity with the provision of the constitution which prohibits re-election for second term of the chief official of the Republic, he would not again be a presidential candidate.

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18. DIPLOMATIC RELATIONS OF THE UNITED STATES WITH MEXICO. Early relations were largely determined first by the Mississippi question and later by the failure to define the western limits of Louisiana in the treaty of 1803 and consequent friction with Spain after 1805.

The American government viewed with sympathy the Mexican revolutions, beginning in 1810, and later accorded belligerent rights to the revolutionary government which was aided by filibustering expeditions from the United States; but it endeavored to maintain neutrality until 1822 when, after the final ratification of the Florida Treaty with Spain, it recognized Mexico as an independent state whose government promptly opened Texas to American immigration.

At the close of 1822 José M. Zozaya was accredited first Mexican Minister at Washington, but the real beginning of the Mexican legation dates from the arrival of Pablo Obregon in November 1824. In March 1825, the American government sent Joel R. Poinsett as Minister to Mexico to recover the prestige lost by delay, but his methods aroused increasing distrust and suspicion which postponed the completion of treaty negotiations and finally led to his recall. After successfully opposing the plans of Mexico to unite with Colombia for the liberation of Cuba, he negotiated a Treaty of Commerce of July 1826 and another treaty of February 1828, both of which failed in the Mexican Congress after ratification by the American Senate. He hastily concluded a Boundary Treaty of January 1828 which was lost by delay in the Mexican Congress, but was revived in 1832 and ratified following the ratification of the new Treaty of Amity and Commerce negotiated in April 1831 by Anthony Butler, the successor to Poinsett.

Meantime there arose new sources of friction which produced strained relations after 1829, temporary severance of relations in 1836 and finally (a decade later) resulted in war. In Texas, which the United States unsuccessfully attempted to purchase in 1825, 1827 and 1829, internal troubles arising from differences between the Mexican government and the American colonists, and increasing after the Mexican attempt to prohibit American immigration in 1829 and the Mexican establishment of military posts in 1831, finally resulted in a successful revolution of 1835, in which many Americans participated and also in the American recognition (in 1837) of Texan independence — which, together with other grievances, aroused the hostility of Mexico. Relations temporarily severed in 1836 were again seriously threatened in 1837 by the withdrawal of the Mexican Minister who was not replaced by a successor at Washington until 1842. In 1835 President Jackson, renewing proposals to Mexico for purchase of Texas, authorized negotiations for a boundary on the parallel of 37° westward from the Rio Grande to the Pacific, but in 1837 he declined Texan offers of annexation.

Relations were also endangered by Amer-

ican claims (against Mexico) which in 1837 brought the American government to the verge of reprisals by force. Attempts at adjustment were made by the Convention of 1838 which was not ratified by the American government, and by another Convention which was ratified by both parties in April 1839 and made effective by acts of Congress approved on 12 June 1840 and on 1 Sept. 1841. These claims, allowed by a commission under the Convention of 1839 and a later Convention of 1843, were only partially paid, and later negotiations for another Convention were prevented by war.

Following the American annexation of Texas by joint resolution in March 1845 (after failure of the Senate to ratify an American-Texan Treaty of Annexation), Mexico again severed relations and later refused to receive John Slidell whom President Polk sent to Mexico to re-establish relations and to negotiate for adjustment of claims and for the annexation of California which was the chief aim of his Mexican policy. Finally, in the rich pasture lands of the border territory in dispute between the Rio Grande and the Nueces, the clash of rival military forces precipitated war, recognized as existing by declaration of the American Congress in May 1846.

Peace negotiations following the war were begun by the American government in April 1847 after important victories at Buena Vista and Vera Cruz. Nicholas P. Trist was sent as confidential agent with instructions similar to those of Slidell and with full powers to conclude a treaty of peace at a propitious moment. In November 1847, however, he received instructions to return. Unexpectedly detained, he finally determined to remain; and without the authority of his government, he negotiated the Treaty of Guadalupe Hidalgo of 2 Feb. 1848, by which the Mexican government ceded New Mexico and Upper California for $15,000,000 and the American assumption of all American claims against Mexico. This treaty, including all Polk's *sine qua non* except the right of transit over Tehuantepec (which had become less important by the recent acquisition of rights over a better route by the Treaty with New Granada), on its arrival at Washington was hastily accepted by Polk, who, although he refused to pay the salary of the "impudent" clerk, was anxious for peace.

For over a quarter-century after 1848, relations were disturbed by border turbulence, filibustering expeditions, Mexican internal troubles, questions of new claims and of protection of transit routes and apprehension of European designs or of foreign intervention.

In compliance with a demand for additional territory, James Gadsden concluded with Mexico a Treaty of 30 Dec. 1853, by which the United States for $10,000,000 obtained south of the Gila River a strip of territory including the Mesilla Valley, and also a right of transit across the Isthmus of Tehuantepec where conflicting interests complicated later negotiations and relations.

The Mexican problem, which thrice had been adjusted by change of boundaries, still persisted after the Gadsden Purchase. Complicated with Southern interests, and largely under the influence of Southern statesmen, the remedy most persistently proposed for its solution, in connection with an American transit route across Mexico, was an additional reduction of Mexican territory by a new cession to the United States, or, if that should fail, the establishment of an American protectorate which was expected in time to result in new annexations to the stronger country. The problem, only partially solved by the Pierce administration, was inherited by the Buchanan administration, which continued to negotiate — first, for the acquisition of additional Mexican territory and territorial concessions as long as there was any hope of success, and later for territorial concessions and alliance and direct intervention (to enforce treaty stipulations) until the secession of the Southern States precipitated the beginning of the American Civil War and thereby increased the possibility and probability of the long-predicted intervention of European powers in Mexico, and exposed Mexican territory to the possible designs of Confederate filibusters.

The sequel to the story of persistent negotiations, which terminated in an unratified treaty, may be found in the Confederate policy to form an alliance with Mexico or to absorb it, the French policy of intervention in Mexico, and the American policy under Seward to prevent the execution of both Confederate and French policies and to preserve the integrity and independence of Mexico.

Through the entire period of the Civil War the American government consistently maintained cordial relations with the constitutional Juarez government. In 1861 it obtained through Mr. Corwin a Treaty of Extradition of Criminals and Fugitives from Justice. To guard against the extinction of the Mexican Republic or the danger of European intervention, it authorized the negotiation of a treaty obligating the United States to pay the interest on the Mexican funded debt for five years and to take for security a mortgage or pledge on the public lands and mineral rights of northern Mexico (Lower California, Chihuahua, Sonora and Sinaloa). This plan, however, did not meet the approval of France and England and was also opposed at Washington by senators who feared it might result in annexation.

Against the French invasion and occupation of Mexico and the establishment of the Maximilian government, which was regarded inimical to republic institutions in America, the government at Washington promptly protested and issued discreet warnings. Later it demanded withdrawal of French forces from Mexico, resulting in the fall of Maximilian in 1867 and the restoration of the republican form of government.

The United States concluded with Mexico in 1868, a naturalization convention regulating citizenship of emigrants and a claims commission convention for adjustment of mutual claims. Under the latter a commission was duly organized at Washington 31 July 1869. Its powers were extended by convention of 19 April 1871 and again by a convention of 27 Nov. 1872. A mutual arbitration provided by the treaty gave a balance of about $4,250,000 to American citizens. The famous Pious Fund Case (q.v.), first presented for adjustment to the Mexican Claims Convention in 1870, became a source of a new difference which was finally settled under a protocol of 1902 submitting it to the Permanent Court of The Hague.

For a decade after the withdrawal of the French, Mexico was disturbed by domestic contentions attended with serious border lawlessness which at times impaired good relations and gave rise to troublesome questions and difficulties reaching an acute stage after November 1876, when the constitutional order of Mexico, which the United States had continually recognized for 17 years (since 1859), was overthrown by the successful military revolution of Gen. Porfirio Diaz. The cattle raids from Tamaulipas on the Lower Rio Grande, which had caused trouble since 1848 and had become prominent in the remarkable incident known as the Cortina war in 1859–60, but had declined during the Civil War, were renewed at the close of the campaign against Maximilian, and culminated in the Corpus Christi Raid of 1875 which attracted the attention of the American government to the precarious position of Americans along the border. These raids and depredations were intimately connected with the collateral question of the condition of the free zone along the Mexican side of the Rio Grande and the subject of extradition. Meantime the American government continued a temporizing neglectful policy, but, in 1875, it sent additional troops to the border and finally on 1 June 1877, authorized Federal forces to cross the border in hot pursuit.

The dangerous breach in relations of amity was for a time widened by the delay of the American government under President Hayes to recognize the government of Diaz. Finally the American Minister (John W. Foster), who had advised against the withholding of recognition, received authority by which he promptly placed himself in official relations with the Diaz government on 11 April 1878, nearly a year after it had been recognized by the other powers. Meanwhile, in December 1877, the House of Representatives adopted resolutions looking toward a consideration of the best means of removing the existing and impending causes of difference and of confirming and enlarging commercial relations.

The friendly feeling manifested following recognition of Diaz was of brief duration. Negotiations, which encountered delays, were rendered more difficult by complications resulting from new revolutions and disorders. American forces again crossed the border in hot pursuit of marauders in the spring and summer of 1878. Diaz, induced by Mexican clamor, demanded the withdrawal of the American order for crossing the border. This the administration at Washington declined to do. By October 1878 the situation threatened to result in war. Finally, with the establishment of orderly conditions by co-operative action in 1879, the American government in 1880 withdrew the order for crossing the border.

At the same time by the steady growth of centralized power in Mexico, relations had become increasingly friendly. The danger from Mexican internal disorders had largely disappeared in 1880, when Diaz retired and acquiesced in the election of his lieutenant whom he succeeded by re-election four years later. Border conditions rapidly improved. A reciprocity treaty was signed in 1882 and troublesome questions of the "free zone" and extradition were considered in a friendly spirit. A partial relief from the continuation of border lawlessness was sought in 1882 in the agreement (later renewed yearly for several years) providing for crossing the border by armed forces of either country in pursuit of Indians, and by a convention for the establishment of the international boundary by suitable commissions of survey.

Steady improvement in relations was also greatly aided by extension of railway communication to the frontier by 1881, and to the interior of Mexico by 1883–84, by American capital and also by connecting the telegraph systems of the two countries through the completion of a submarine cable in March 1881. The establishment and multiplication of international railway communications, revolutionizing commercial conditions, largely supplanted the need of reciprocity treaties which, although negotiated in 1882 and 1891, were defeated in the American Congress.

Relations continued to improve in mutual friendliness, although public opinion in Mexico was divided between a policy of isolation and a policy of closer intercourse and concessions for industrial enterprises. In pursuance of the latter policy, the Mexican government by 1889 modified the old Mexican land laws and gave to American citizens liberal railroad, mineral and other grants.

A better understanding followed the establishment of an international water boundary commission in 1889 and the remarking of the southwestern boundary westward from El Paso in 1891–96, as defined by the Treaty of 1848. An unsatisfactory effort was made in 1895 to remedy the abuse of the Mexican free zone by smugglers. In 1896 a copyright treaty was negotiated and in 1899 an extradition treaty (supplemented in 1902). In 1895, through the good offices of the United States, Mexico concluded with Guatemala an arbitration convention for settlement of a long-standing boundary dispute. In 1900 the Mexican Congress appropriated $30,000 for sufferers in the Galveston disaster.

The better understanding was indicated by the reference of the famous Pious Fund controversy to arbitration by The Hague Court (1902), the adjustment of boundary difficulties arising from the shifting of the Rio Grande and Colorado rivers, the negotiation of a convention (of May 1906) for the equitable distribution of the waters of the Rio Grande for irrigation purposes and the negotiation of an arbitration treaty in 1908. It was especially illustrated by the Americo-Mexican co-operation in 1907 in plans tactfully initiated by the United States to maintain order in Central America.

The growing intimacy of relations during the long presidency of Diaz, indicated by many international agreements, culminated in a general treaty of arbitration and the meeting of Taft and Diaz in 1910.

Relations again became strained after 1911 in connection with the collapse of the Diaz government and by conditions of the Maderista revolution, both in Mexico and along the border, which were a source of much concern to the United States.

The American government under President Taft, although it mobilized troops on the frontier, declined to intervene and with difficulty maintained neutrality — both before and after

it recognized the new government of Madero, which was finally overthrown in February 1913 by Felix Diaz and General Huerta. In 1912 the rumor of Japanese plans to secure a harbor at Magdalena Bay caused the Senate to pass an opposing resolution which, however, was not accepted by President Taft.

Under President Wilson's new policy of using non-recognition as a means of discouraging the establishment of governments based on force and violence, the American government refused to recognize Huerta, unsuccessfully urged an early free election in Mexico, warned Americans to leave that country and vigorously demanded both the *de facto* government of Huerta and insurrectionists to respect lives and property of Americans.

In April 1914, after a series of irritations and insults it sought reparation by a naval and military force which occupied Vera Cruz; but, with certain restrictions, it promptly accepted friendly mediation of the A B C powers of South America (Argentine, Brazil and Chile) which in May 1914 considered plans for settlement of the internal and external difficulties of Mexico.

Finally, after the failure of an appeal (by a Latin-American conference at Washington) to the rival factions to settle their differences, the American government, on 19 Oct. 1915, recognized the Carranza government as the *de facto* government of Mexico.

In March 1916 a new trouble arose from an attack of Villistas on the American town of Columbus, N. Mex., instigating the American government to send a punitive American force under General Pershing into Mexico in hot pursuit. Carranza protested and insisted upon withdrawal while the United States, refusing to recede from a settled determination to maintain its national right and its duty to remove the peril, called 150,000 militia to the border. The situation during a period of negotiations was complicated by a new raid of Mexican bandits into Texas. An encounter with Mexican troops, resulting in casualties on both sides and capture of 17 Americans as prisoners, threatened to produce a final crisis which was averted only by Mexican acquiescence in the American demand for immediate release of the prisoners. The strain of the situation continued until complications were solved by agreement upon a joint commission of six members, who, however, could not reach an acceptable plan of action. Early in 1917, the American government, after gradually withdrawing American troops, sent an ambassador to the Mexican government of Carranza under whose auspices preparations for better conditions were begun by the adoption of a new national Constitution.

Later relations were affected by conditions relating to the World War. In February 1917 when the American government was becoming more determined in its resistance to Germany's piratical acts against American rights upon the seas, Mexico proposed to neutrals to invite the European belligerents to terminate the conflict, or, in case of failure, to reduce the conflagration by refusing any kind of implements and by suspending commercial relations. In reply the American government, declining the proposal, exposed a recently discovered plot of the German government to induce Mexico to negotiate an alliance with Japan for war against the United States by offering Mexico as the price of her co-operation with Germany the recovery of territory ceded to the United States in 1848. Although the Mexican government denied any participation in the plot, German influence in Mexico continued inimical to the United States.

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MEXICO, a state of the United States of Mexico, in the southeast; bounded by the state of Hidalgo on the north, on the east by Tlaxcala and Puebla, on the south by Morelos and Guerrero, and on the west by Michoacan and Queretaro. Adjoining the state of Morelos is the federal district enclosed by the state of Mexico but outside of its jurisdiction. The area of the state of Mexico is 9,247 square miles and its population about 1,000,900. The capital is Toluca. Several railroads traverse the state and centre in Mexico City.

MEXICO, Mo., city, county-seat of Audrain County, on Salt River and on the Wabash, the Chicago and Alton and the Burlington railroads; about 115 miles northwest of Saint Louis. Mexico was settled in 1833 and in 1857 was incorporated. It is in an agricultural section, the chief products of which are wheat and corn. The manufactures are dressed marble, flour, shoes, cigars, stove lining, fire-brick products. Mexico is the centre of the saddle-horse producing section of the West. It leads also in mules and livestock and has recently completed 18 miles of electric railway north to Santa Fé, Mo. Corn, wheat and blue grass are principal products. Mexico is the seat of the Missouri Military Academy and of the Hardin College for Women, founded in 1873. The charter under which the government is administered was granted in 1893, and provides for a mayor who holds office two years, and a council. Pop. 5,939.